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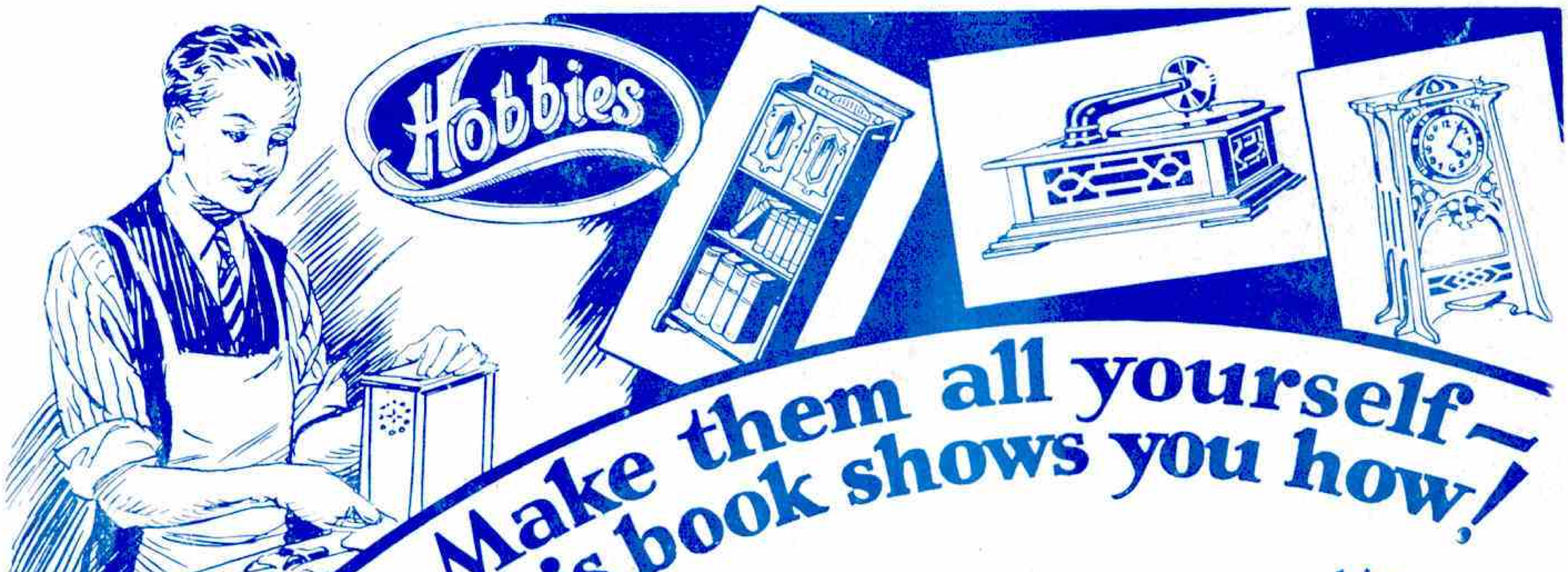
MECCANO MAGAZINE

THE "BOURNEMOUTH LIMITED"

(See page 914)

6d.



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MECCANO MAGAZINE

Editorial Office:
Binns Road
Liverpool
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Vol. XIV. No. 12
December, 1929

With the Editor

Christmas Greetings to You All

My first duty—a pleasurable one—this month is to send the Season's Greetings to my tens of thousands of readers at home and abroad. It is perhaps early to be thinking of Christmas (although we in Meccanoland have had little else in our minds since January last !), but as this issue of the *"M.M."* is the last before the great day comes, I must take this opportunity of sending my Best Wishes to everyone.

Each year our great brotherhood of Meccano and Hornby Train boys grows larger, and every Christmas we make hundreds of thousands of new friends, each of whom has great pleasure in store and happy days ahead. I am sure that readers of the *"M.M."* will remember their new friends this Christmas time when they broadcast, by their thoughts, a message of goodwill and friendship to Meccano boys of all ages and of all nationalities. (It has occurred to me that it would be interesting if we fixed 10.30 on Christmas morning as a special time at which we might all wish each other " A Merry Christmas.")

Keep the Postman Busy!

As to Christmas itself—well, the welcome precursor of the Festive Season is the breaking up for the holidays, which are always the jolliest of the year. Not the least extraordinary thing about them is the fact that although a holiday usually is regarded as completely ruined unless the weather behaves itself, at Christmas-time nobody cares what happens ! Whatever the weather may be, we make ourselves comfortable in warm, brightly-lit rooms, gay with decorations, and strange to say we actually feel happier if the temperature falls below freezing point ! Should there be a downfall of snow we are more pleased than ever, because then we are able to enjoy snow-fights and for others where the locality permits, there is all the fun and thrills of sledging.

To most people, I suppose, the excitement of Christmas has passed by the New Year, but my case is perhaps an exception for echoes of the festive season continue to reach me for many weeks after. During those weeks my mail bag is heavier than at any other time of the year, and contains thousands of letters from readers, telling me about the happy times they had at Christmas. What is equally as pleasant as hearing from old readers, is to receive letters from thousands of new friends who have been brought into contact through having received a Meccano Outfit or Hornby Train on Christmas Day.

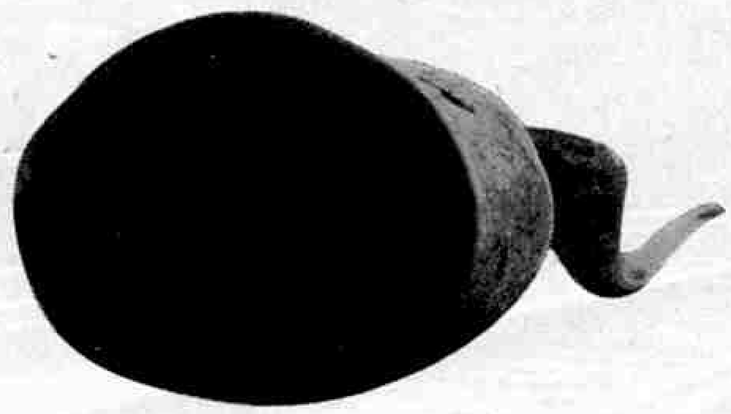
"If in Doubt—Write to the 'M.M.'"

One of our outstanding features of the past year has been the appearance of the first of the series of articles under the title of " What Shall I Be ? " This is a subject of the greatest importance to the majority of my readers. Many experience difficulty in choosing a career because of lack of knowledge of the opportunities offered in various trades and professions—they do not know what steps to take in order to make a good start in the one that is most suitable. It is to supply this deficiency that these articles are being published.

These articles, which deal with the subject thoroughly and in considerable detail, will be continued in 1930. What is perhaps of even greater importance is the fact that the articles are supplemented by further information and advice, freely placed at the disposal of every reader who cares to write to me for it.

In our articles we can devote only a limited amount of space to each industry or profession, and in many cases there may be little difficulties that require advice of a more individual character. For this reason I hope that every reader who is in doubt on any point will write to me stating his special circumstances. The experience and knowledge of myself and my staff are at the disposal of every reader, and I regard it as a joy and a privilege to be able to help genuine enquiries.

No. 13. WHAT EVER IS IT?



Here is the thirteenth puzzle in our popular series of mystery photographs. To the first reader who identifies this mysterious-looking object, or to the reader who gets nearest, I will send an autographed copy of my new book " Wonders of Engineering."

Solutions should be written on postcards only and addressed " Editorial Competition No. 13," Meccano Magazine, Old Swan, Liverpool. Post your entries to reach me before 31st December next.

Our Plans for 1930

During the coming year the features that have proved popular with my readers will be continued. Among these are the pages devoted to model railway topics. These will continue to be of the same practical type as those that have appeared during 1929, and will further enhance the position that the *"M.M."* has attained as the standard publication for all model railway enthusiasts.

Many new series of articles of a specially interesting character also will appear during 1930. These will rival in favour those that have gone before, and I shall continue to do my utmost to make the Magazine even more attractive than it is at present.

Mystery Photographs

Our attempt to puzzle readers by publishing in the November *"M.M"* a photograph of the Eiffel Tower taken from an extraordinary point of view, has proved a complete failure ! In front of me as I write is an enormous pile of postcards giving correct solutions, and even the few incorrect entries received can scarcely be reckoned failures, for in practically all cases the photograph was described as one taken from the top of a tower. The successful candidate is B. R. Hutchinson, 40, Bolton Road, Farnworth, and to him a copy of my new book *" Wonders of Engineering "* has been forwarded.

In response to numerous requests I should like to announce that these extraordinarily popular puzzles will be continued during 1930. They provide interesting amusement for thousands of readers as well as to those who actually send in solutions. Even fathers and uncles take an interest in them, and I have heard of heated debates taking place in offices and among business men of a type that one would never have thought ever looked at a *" Meccano Magazine ! "* Some real " teasers " are being prepared for 1930 competitions. As to No. 13 in the series, shown on this page—it is an excellent example of progress. A year ago I should have expected this to tax the powers of my readers to the utmost, but the intervening competitions have sharpened their eyes considerably, and I shall not be surprised to receive a number of correct replies immediately after the publication of this issue !

FAMOUS TRAINS: XXXIV.

A Run on the "*Bournemouth Limited*"

London to the South Coast Non-Stop

OUR cover this month shows the Southern Railway "*Bournemouth Limited*," the most recent introduction among famous British trains. This train made its first run on 8th July last, and now leaves Bournemouth daily at 8.40 a.m., returning from Waterloo at 4.30 in the afternoon. Usually, it is drawn by a locomotive of the "King Arthur" class—the one shown on our cover is No. 789, "*Sir Guy*"—and the journey of 108 miles is made in two hours.

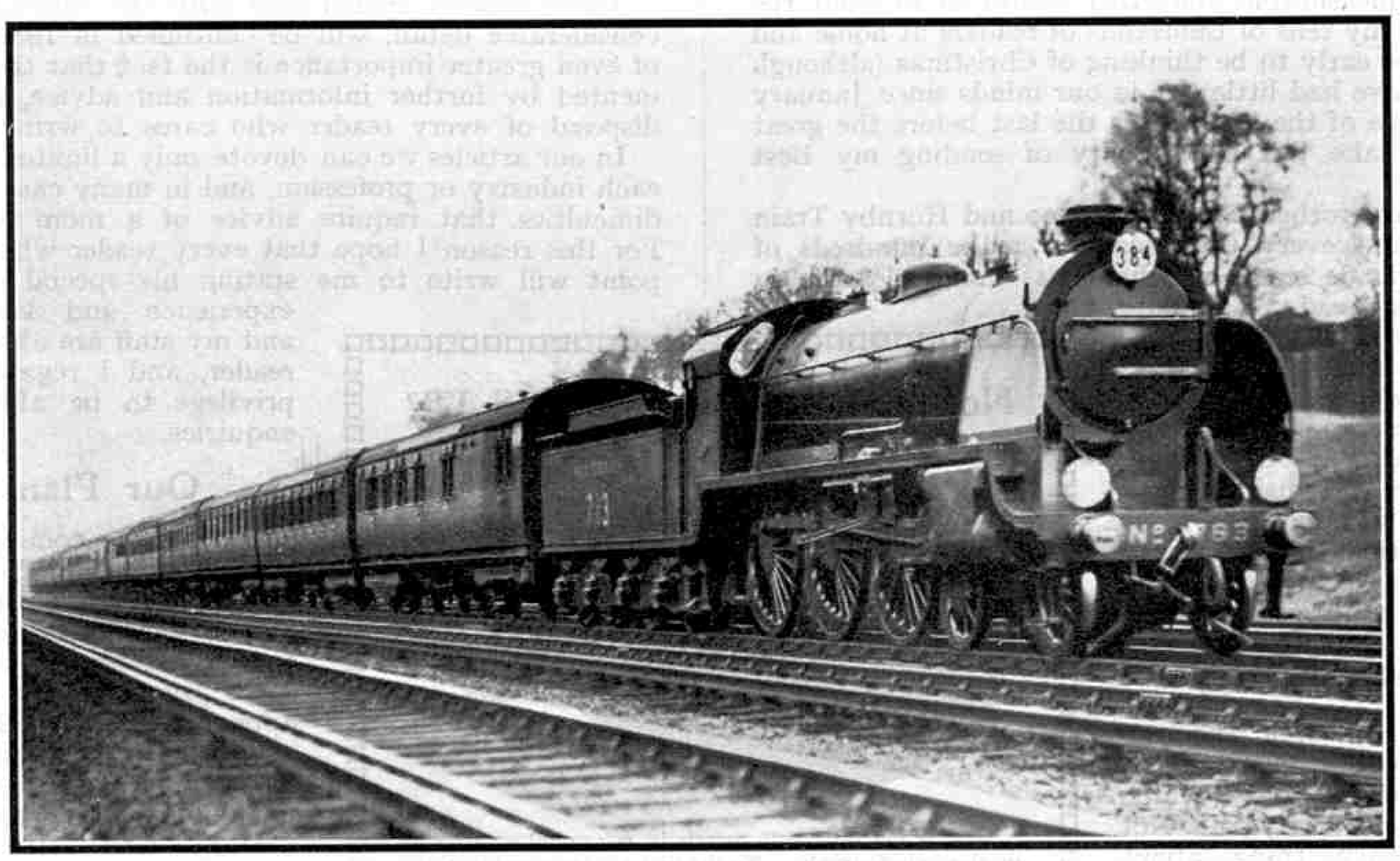
Travelling between London and Bournemouth in two hours is by no means a new experience, for as early as 1911 certain trains on the Bournemouth service of the then London and South Western Railway were accelerated to make the run in that time. Three trains, two "up" and one "down," ran to a two-hour schedule, and to another "down" train only six minutes more were allowed in order to enable a stop to be made at Christchurch.

In common with most English express services those of the L.S.W.R. suffered severely during the War. The two-hour schedule for the Bournemouth expresses disappeared and was not restored when hostilities came to an end and conditions became normal. A great improvement was brought about in the summer of 1919 however, when the principle of arranging the departure of long distance main line trains at even times was introduced on the L.S.W.R. Naturally, the Bournemouth trains were included in the scheme and at the same time the service as a whole was materially improved, although the actual running times remained unaltered. The principle was adopted by the Southern Railway, into which the L.S.W.R. was merged, and to-day the Bournemouth service probably is the most complete of those operated in this manner. Passengers make the journey comfortably in luxuriously appointed corridor coaches, and every train is equipped with a restaurant car.

In the early part of this year the only step that remained to be carried out in order to make the service completely modern was the re-introduction of the pre-war timing, and this came on 8th July of this year. Every day during the summer four expresses now make the run in two hours, and on certain days this number is exceeded. The four that regularly maintain the improved timing are the 10.30 a.m. and 4.30 p.m. "down," and the 8.40 a.m. and 5.15 p.m. "up." It is the 4.30 p.m. "down" that has become officially known as the "*Bournemouth Limited.*" The corresponding "up" train is the 8.40 a.m. and is also included in the official title. These two trains maintain the two-hour schedule throughout the year.

Those who wish to travel on this now famous express must book their seats if they do not wish to be disappointed, for as the name denotes, the accommodation is limited. This keeps the weight of the rolling stock down to the reasonable figure of a little more than 330 tons, and thus helps greatly in the maintenance of punctuality under all reasonable conditions.

When standing in Waterloo Station the destination boards of the train quickly attract attention, for the first four vehicles are plainly marked "*Bournemouth Limited.*" These are a corridor brake third, corridor third and first-class coaches, and a second corridor brake third, all of which are destined for Bournemouth West. The entire train is composed of ten vehicles, the coaches for Bournemouth West being followed by a corridor brake third, a corridor composite, a dining car, and a corridor third for Weymouth, and by a corridor brake composite and a corridor brake third for Swanage. The various portions of the train are clearly marked, the destination boards of the coaches for Weymouth being lettered for Waterloo, Bournemouth Central, Dorchester and Weymouth. Those of the Swanage portion indicate equally plainly that these two coaches serve Wareham and Swanage.

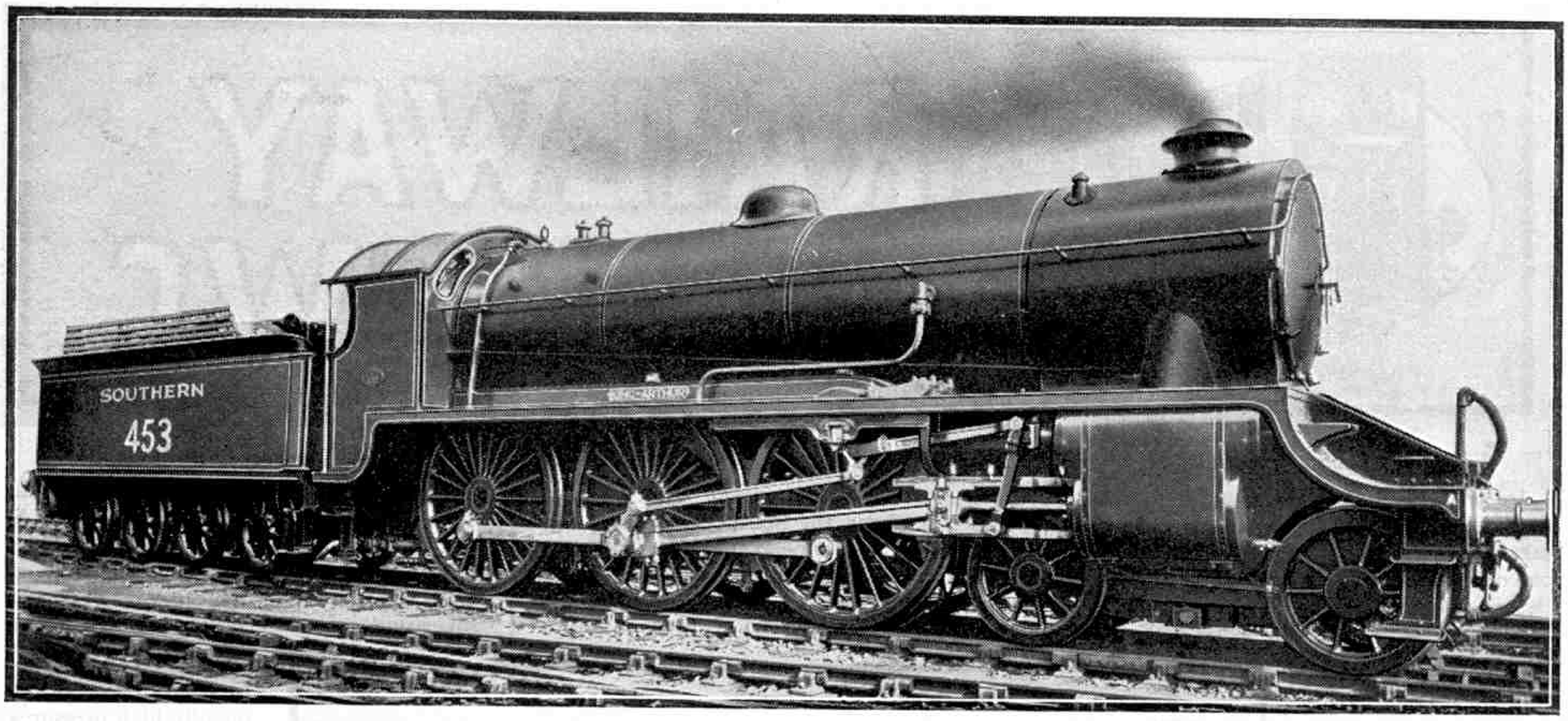


Down "*Bournemouth Express*" hauled by "King Arthur" class locomotive No. E.783 "*Sir Gillemere.*" For permission to reproduce this and the other illustrations to this article we are indebted to the courtesy of the Southern Railway

At the head of the train one of the "King Arthur" class usually may be found, but at times a "Lord Nelson" may have charge of the train. The locomotives that were in use in the pre-war period when the two-hour schedule was in force were not always capable of keeping time, especially if they had to haul a somewhat heavier load than usual. No difficulties of this kind are met with to-day, however, for both "King Arthurs" and "Lord Nelsons" appear to be capable of hauling any reasonable weight and maintaining booked time without showing signs of being forced.

An instance of the ability of modern locomotives of the Southern Railway to cope with their task was given on a trial trip run on July 4th, four days before the "*Bournemouth Limited*" commenced its career. On that occasion the load was 13 coaches, and the locomotive in charge was No. E860 "*Lord Hawke,*" one of the "Lord Nelson" class. In spite of several checks and service slacks the train ran into Bournemouth Central 1¼ min. early. Between Hinton Admiral and Christchurch a speed of 85 m.p.h. was reached, but even at that pace the train travelled with remarkable smoothness.

In making a trip on the "*Bournemouth Limited*" we will imagine ourselves to have spent a pleasant holiday at Bournemouth and to be returning to London. On arrival in Bournemouth West Station we find waiting for us the steel panelled rolling stock of the latest type of which the train is composed, the green finish of the vehicles giving them a very pleasing appearance. If we follow the example of a large proportion of passengers and walk up the platform a few minutes before our departure, we may find at the head of our train a "Lord Nelson." More probably our locomotive will be a "King Arthur," however, and it is almost certain that it will be fitted with the now familiar sheet steel "wings" at each side of the smoke-box. The purpose of these



No. E.453 "*King Arthur*," the first of the class of 2-cylinder 4-6-0 locomotives designed by Mr. R. E. L. Maunsell. The earliest members of this class appeared in 1925, and as shown above were fitted with tenders of the "Drummond" pattern

is to create a strong upward draught of air that will deflect the exhaust steam well clear of the cab windows. This is particularly desirable when working on short cut-offs, for then the exhaust steam is not flung out of the chimney with great violence and tends to hang about the boiler and cab front.

For the 28.7 miles from Bournemouth to Southampton West we are allowed 34½ min., with service slacks at Christchurch and Redbridge. This stretch of road is not difficult, and over it the powerful locomotive hauls the train with no apparent exertion. At Redbridge we pass the chief permanent way depot of the Southern Railway, and shortly afterward we reach Southampton. After catching a fleeting glimpse of the great docks we run through Southampton West and on to Northam Junction, where the original line from the terminal station at Southampton joins our route. Here the curve is extremely severe and speed is reduced to little more than 20 m.p.h. Another 4.6 miles, for which we have an allowance of 6½ min., brings us to Eastleigh, the home of the locomotive works at which the earliest of the "King Arthurs" were built. Possibly our locomotive is one of these, but it may be one of the later series built in 1926 in Scotland.

We are now climbing the long slope, 16½ miles in length, that ends only at Litchfield Tunnel. The average gradient is 1 in 250, but even the quite respectable load of the "*Bournemouth Limited*" does not appear to trouble our locomotive during the ascent, for we top the rise at a little less than 50 m.p.h., and there is very little of the snorting and puffing traditionally associated with "collar work" of this nature. The design of the engine is partly responsible for the absence of noise, for even when the "King Arthurs" are running at high speed the sound most easily detected is the ticking of the crosshead vacuum pump.

Two miles before reaching the end of the climb we encounter a minor curiosity. This is the deep and wide cutting in the chalk at Micheldever, which is between two tunnels. As we pass through it we catch glimpses of quarrymen at work breaking away chalk and throwing it down the slopes to the wagons that will take it away from this remarkable quarry.

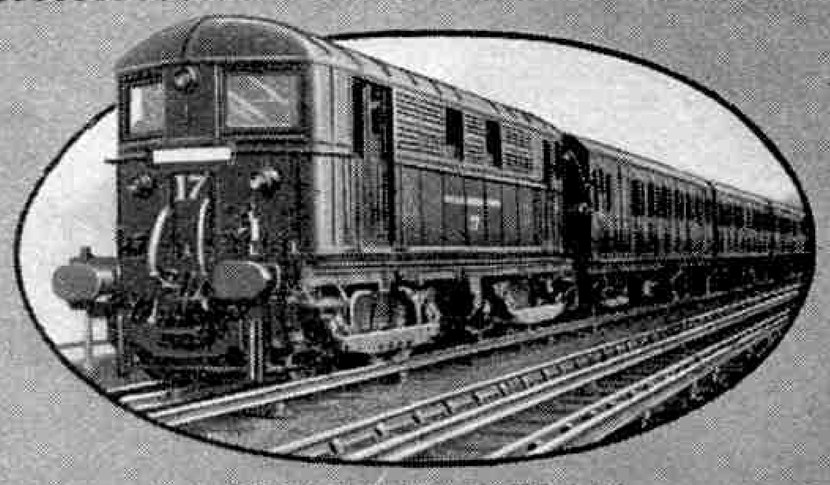
From Litchfield we run through Wootton to Worting Junction, where we run on to the metals of the West of England main line. We are now gathering speed and through Basingstoke we travel at 65 m.p.h., the gradient of 1 in 249 being in our favour. Along the 8-mile stretch from Basingstoke to Winchfield we continue to accelerate and at Fleet, which is at the end of a 3-mile down gradient of 1 in 337, our speed is in the neighbourhood of 71 m.p.h.

The road continues to be favourable for fast running, for up to a point within a mile of Weybridge it is either level or on a slight down gradient. On this stretch we register the highest speed of the run, and through Byfleet we race at more than 75 m.p.h., and even may touch 80 m.p.h., a rate of progress that makes us think our locomotive is trying to emulate a racing car on the track at Brooklands, which is visible on our right.

E.777 "*Sir Lamiel*" on the "down" "*Bournemouth Limited*," passing Durnsford Road Power Station. The locomotive is fitted with smoke-box deflectors in order to carry the exhaust steam clear of the cab windows

While flying along in this manner between Basingstoke and Woking we remember that along this splendid length of track signalling is entirely automatic. Except at stations and certain points where for special reasons signal-boxes yet remain, the signals are electro-pneumatic and are worked by the trains themselves. An installation of this kind is of the greatest value on this extremely busy portion of the track, over which a frequent service of tightly-timed expresses is run during the greater part of the day.

From Woking to Hampton Court Junction we are allowed 10½ min. to cover the 11 miles, and we maintain a steady high speed, our driver wisely keeping a minute or two in reserve in order to allow for possible delays in the electrified area through which we run in the final stages of our journey. Suburban stations flash by in quick succession, and as we approach (*Continued on page 954*)



A METROPOLITAN TRAIN

RAILWAY NEWS

L.M.S. Locomotive News

In two instances clear proof recently has been given of the keen interest that is taken in the naming of locomotives. In one case it was pointed out to the authorities of the L.M.S. that the name of the London Irish Rifle Regiment had been omitted from the list of those after which "Royal Scot" locomotives had been named. In response, it was agreed that No. 6138, "*Fury*," should be renamed "*London Irish Rifleman*." Later this engine was employed to draw the train in which the men of the Royal Ulster Regiment left Euston on their return to Ulster. The Officer Commanding the regiment then presented to Sir Josiah Stamp—the President of the L.M.S.—a pair of regimental crests with which to adorn the engine.

In the other instance a Scottish regiment was concerned. Early in November the Royal Scots Greys left Edinburgh for Tidworth, and the first of the four special trains in which the journey was made was hauled by engine No. 6101, "*Royal Scots Grey*." This engine had been placed at the disposal of the regiment at the request of the Officer Commanding.

Crewe Works continues to turn out 0–8–0 standard freight engines, No. 9563 being the most recent. Nos. 9540-4 have been sent to work on the Midland division, and Nos. 9545-53 to the L. & Y. section of the Central division. At present the later engines of this type are working from Crewe South shed.

Fifty 2–6–2 tank engines, intended for work on the Midland and Western divisions, are to be built at Derby. Probably some will be employed on the Tilbury and Southend line. Their numbers are to run from 15500 to 15549.

One of the former London, Tilbury and Southend Railway 4–6–4 "Baltic" tanks, No. 2107, has been broken up at Crewe. Recent withdrawals include Nos. 8341, 8394 and 8455 0–6–0 goods locomotives of what is sometimes called the "Cauliflower" class, and also Nos. 7376, 7389 and 7395 0–6–0 Special Tanks.

Electric Trains to Brighton

In view of the recent remission of passenger duty, the Southern Railway has undertaken an expenditure of £2,000,000 for improvements to its system. Chief among these is the electrification of the main line to Brighton. This is 51 miles in length, and the section of 14 miles to Purley already has been electrified. The branch from Preston Park on the Brighton main line, to Hove and Worthing, which is 11 miles in length, also is to be electrified.

When completed this will be much the longest electrified route in Great Britain, and the first main line to be completely equipped for electric traction. The trains will run on the direct current third-rail system which is now standard on the Southern Railway. It is hoped that the whole of the work will be completed in two to three years' time.

L.N.E.R. Dock Improvements at Hull

Now that 20-ton wagons are becoming increasingly popular, the coal shipping appliances at the principal L.N.E.R. docks at Hull are to be adapted to enable these to be handled. This is in accordance with the L.N.E.R. general practice of using high capacity wagons wherever possible. The King George Dock at Hull is already capable of dealing with large wagons, and the proposal is to bring the older Docks into line.

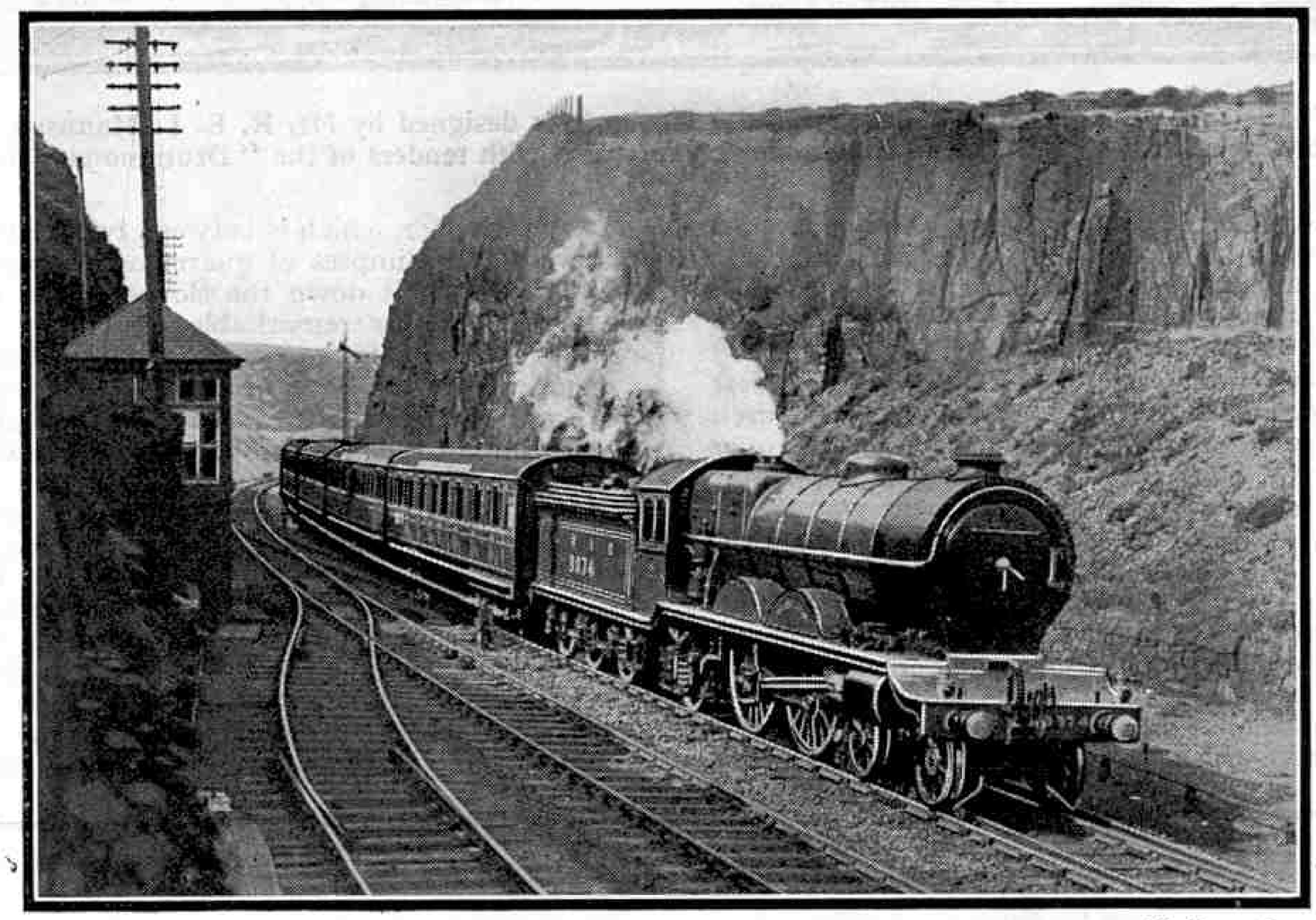
High-Pressure Locomotives

The advent of the two experimental high-pressure locomotives of the L.M.S. and L.N.E.R. is eagerly awaited. Their building has taken longer than was at first anticipated. This, however, is not surprising, as many problems have arisen for which solutions have had to be found. In view of the exceptionally high pressures to be employed, many of the usual standard details of equipment cannot be used. Special injectors, gauges, and other fittings, have to be designed and constructed.

The locomotive that is building for the L.M.S. is about equal in size to the standard "Royal Scot" type, but it has a double-boiler pressure system of 900 and 250 lbs. per square inch. It is a compound and has six coupled wheels, 6 ft. 9 in. in diameter. It will carry the No. 6399.

The engine that is being built by the L.N.E.R. is fitted with a water-tube boiler of the Yarrow type that has been specially adapted for this locomotive by Mr. Gresley. It has a working pressure of 450 lbs. to the square inch.

These engines mark a new departure in British locomotive design and their performances will be watched with great interest by all railway enthusiasts and especially by students of economy.



Photo] [*G. Cummings*

A reader's photograph of L.N.E.R. 9874 "*Dunedin*," one of the N.B. Atlantics, near Forth Bridge

Colour Scheme for C.N.R. Engines

The Canadian National Railways have adopted a colour scheme of bright green, vermilion and black for their famous "6100" type locomotives, which are among the largest and most powerful passenger locomotives in the world. The first to appear in the new colours is No. 6138, which hauls the "*International Limited*" between Montreal and Chicago. Light green, the predominating colour, is used for the boiler, tender, tank and wheels. The cab, smoke box, coal hopper, and feed-water heater are black; while the buffer beams at each end, spokes of the wheels and the fluting of the driving rods are in bright red. This marks a new departure in Canadian railway practice.

G.W.R. Locomotive News

The following new engines have been turned out of Swindon Works :—

Passenger 4–6–0 (" Hall " Class) :—No. 4956 " *Plowden Hall.*" No. 4957 " *Postlip Hall.*" No. 4958 " *Priory Hall.*" No. 4959 " *Purley Hall.*" No. 4960 " *Pyle Hall.*"

Goods 0–6–0T :—Nos. 5770 to 5779.

Some 2–6–2 tank engines of a new series are being built at Swindon and the first three, numbered 5101-03, will shortly be in service. They are similar in design to the earlier " 31 " class but the cab and some other details have been slightly altered.

When the locomotives of the " Castle " type first appeared, it was announced that locomotives of the " Star " class requiring rebuilding would be transformed into " Castles." So far only four have been rebuilt in this manner. These are No. 4009, " *Shooting Star* " ; No. 4016, " *Knight of the Golden Fleece* " ; No. 4032, " *Queen Alexandra* " ; and No. 4037, " *Queen Philippa.*" Several others are to be rebuilt shortly, and the first engine of this class, No. 4000, " *North Star,*" is at present at Swindon undergoing transformation. This engine has had an interesting history. It was built in 1906 as a four-cylindered locomotive of the 4–4–2 or " Atlantic " type, and was numbered 40. It was later altered to the 4–6–0 type.

Another " Star," No. 4024, " *Dutch Monarch,*" recently passed through the works at Swindon and was fitted with " Castle " cylinders, having outside steam-pipes, but it still retains the standard " Star " boiler and cab.

L.N.E.R. Locomotive News

Five more 0-6-0 freight engines of the J39 type have been built at Darlington. Their numbers are 2771-75. Another 2-6-0 tender engine—No. 1368—has been completed at Doncaster Works and is intended to work in the North Eastern area.

A Railway Vine

A vine at Knebworth L.N.E.R. station has this season yielded 80 bunches of fine Black Homburg grapes. The vine is 30 years old and grows along the glass roof of a subway within a few feet of the track over which the " *Flying Scotsman* " passes at 60 miles an hour every day.

Jubilee of the Dining Car

It is just 50 years since the first dining-car was put into service in this country. It was a Pullman car and was introduced by the Great Northern Railway Company on the run between London and Leeds. It was attached to the 10 a.m. up train from Leeds, and returned on the 5.30 p.m. down from King's Cross.

Other railways soon followed the example of the G.N.R., but for some time dining accommodation was reserved for first-class passengers only. Dining cars for third-class passengers were introduced on the services between England and Scotland in 1893. Since that time the restaurant services on our British railways have steadily grown until in the summer of this year there were no fewer than 745 trains running daily on which these facilities were provided.

All-Electric Kitchen for L.N.E.R. Express

The L.N.E.R. have introduced a new all-electric cooking and refrigerating kitchen and restaurant car on the 8.15 p.m. " *Hook Continental* " express from Liverpool Street. This is the first electric restaurant to be run on a Continental Boat Express.

Photograph] [*Railway Photographs, Liverpool*

Down " Midday Scot " near Kenton, hauled by three-cylinder 4-6-0 L.M.S. No. 6110 " *Grenadier Guardsman* "

" *The Southern Belle* " Comes of Age

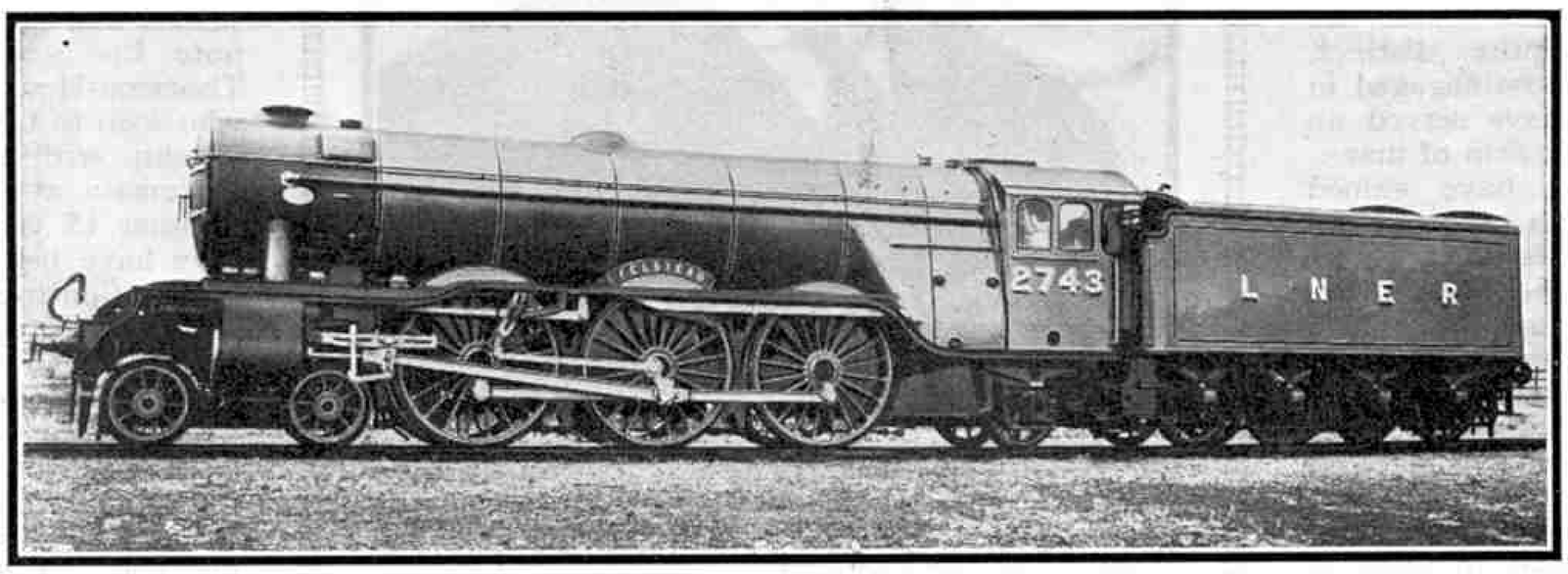
On Friday, November 1st, " *The Southern Belle,*" the famous all-Pullman train that runs between London (Victoria) and Brighton, celebrated its 21st anniversary. The occasion was observed with befitting festivity. The departure platform at Victoria was gaily decorated with flags and the engine—" *Sir Ontzlake,*" of the "King Arthur " type—that drew the train, also was dressed up. In spite of some fog in the neighbourhood of London the run to Brighton was made in 59 minutes, one minute under schedule time.

At Brighton a special luncheon was provided by the Southern Railway Company and a large number of guests were invited. A big birthday cake had been made in honour of " *The Southern Belle* " and the Mayor of Brighton lighted its 21 candles. Running down the room to the top table was a toy railway with a miniature " *Southern Belle,*" and in one of the coaches was the knife for cutting the cake. At the appropriate moment, Driver Cox, who had driven " *The Southern Belle* " on her first trip, started the little engine and away went the train carrying the cake-knife to the Mayor.

In the course of 21 years, " *The Southern Belle* " has carried 4,000,000 passengers and covered a mileage equal to forty times the distance round the world.

" *The Cheltenham Flyer* "

During these winter months the up *"Cheltenham Flyer"* is well maintaining the high standard of running demanded by its stiff schedule of 77¼ miles in 70 minutes. On a Saturday in November when there were two coaches beyond the normal load, the engine No. 4089, " *Donnington Castle,*" made the run in 70 mins. 33 secs. notwithstanding two severe checks. Near Didcot, the belated shunting of a goods train brought down the speed of the express from over 80 m.p.h. to 15 m.p.h., and, later, permanent-way relaying made slow running necessary between Burnham Beeches and Slough. These slacks accounted for fully six minutes and when allowance has been made for them the net time was less than 65 minutes for the 77¼ miles ! Such times show that even the lightning schedules now in vogue have no terrors for modern G.W.R. locomotives.



Courtesy] [*L.N.E.R.*

L.N.E.R. No. 2743 " *Felstead* " one of the new high pressure " Pacifics " built at Doncaster last year. Attached to the locomotive is a corridor tender of the type used on long distance non-stop runs

WHAT SHALL I BE

IN the first article in this series the means by which boys and young men become Mechanical Engineers were described in detail, and this month we propose to deal in a similar manner with Electrical Engineering. This branch is of comparatively recent growth, originating in the discovery in 1831 by Michael Faraday of the principle of the dynamo. Well-known engineers, who were pioneers of the industry, still direct the affairs of large firms that they have founded. As yet Electrical Engineering is still in its infancy, and it holds excellent prospects for any boy who is prepared to work hard in order to master the fundamental principles.

The term Electrical Engineering covers an extensive field and, of course, includes branches concerned with telegraphy and telephony and the more recent development of wireless. Apart from these, the profession may be divided into two parts: the manufacturing and operating sections. Those engaged in the former are employed in the manufacture of electrical machinery of all kinds, including dynamos, motors, transformers and recording instruments. On the operating or power house side, electrical engineers are concerned in the production and distribution of electric current. To a certain degree the two sections are quite distinct, although many of those engaged in power house work have served an apprenticeship with a firm of manufacturers, and thus have gained experience that has proved invaluable. In the present series we propose to deal with the two branches in separate articles, and this month we give a brief outline of the conditions under which boys may enter the manufacturing branch.

As would be expected, the methods of commencing a career on the manufacturing side of Electrical Engineering are similar to those in the allied mechanical branch of the industry. There is no doubt that the best prospects are open to those who follow a University course of training and later acquire experience in a large works, but there are various grades of apprenticeship that may be taken up by boys whose parents are possessed of moderate means. At the present time it is usual for firms to employ three distinct grades of apprentices. These are described as trade, engineering and student apprentices respectively, the last named including those who have received a University training, and we will deal with each of these in turn.

A trade apprenticeship is open to a boy who has attended an elementary school and appears to give promise of capacity for satisfactory progress. A boy who enters the industry by this channel usually is required to take up his apprenticeship before reaching the age of 16 years, but in special cases exceptions to the rule may be made. The period for which the entrant is indentured practically always is five years, and evidence of physical fitness is required by firms of good standing.

The prospects of an apprentice of this kind are limited, for it is necessary that he should choose a recognised trade, and he remains in the shop in which this is carried on throughout his apprenticeship period. In a sense he may be regarded as an apprentice, not to Electrical Engineering, but to one of the subsidiary trades such as fitting and erecting, turning, tool-making, winding and moulding, and the course followed trains the apprentice to become a skilled artisan.

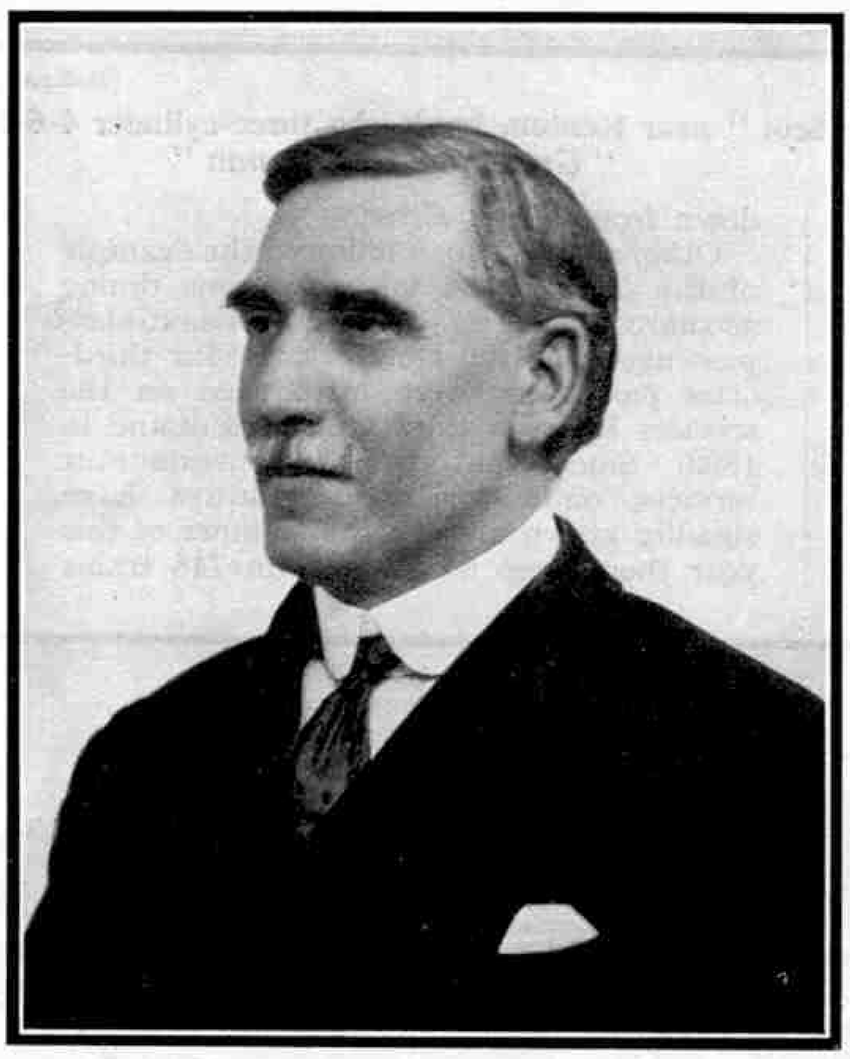
Although the opportunities of the trade apprentice are restricted, a boy who shows special aptitude for his work may eventually secure a good post as a foreman or an inspector. In any case he has no difficulty in making himself a skilled tradesman with excellent prospects, especially if the firm with which he is apprenticed is one that gives every encouragement to employees to seek opportunities of bettering themselves educationally and physically.

This is done by the majority of large firms of electrical manufacturers, and as an example we may note the schemes of the British Thomson-Houston Co. Ltd. Boys who wish to take up a trade apprenticeship with this firm are advised to remain at school until they are at least 15 years of age, and after they have begun work they attend a Day Continuation School for one day per week until they have reached the age of 16. The purpose of this is to enable boys to keep up and widen their knowledge generally until they are old enough to enter the Evening Technical School. Even then interest in their welfare does not end, for any boy who cannot afford to join the Evening Technical Classes may obtain an advance from the Company in order to pay his fees and other necessary expenses.

Every year the records of the apprentices are carefully scrutinised and awards of bonuses and increases in pay are made in accordance with the reports of the foreman and of the Evening Class teacher. The awards also may take the form of permission to spend six months in another department of the works, or of transference to some other course, such as the Drawing Office course or the Engineering course. The last of these is a very valuable privilege for it opens up new avenues of advancement.

The wages received by apprentices vary considerably in different parts of the country and according to the standing of the company with which they are employed. On the whole they are slightly

FAMOUS ENGINEERS—2

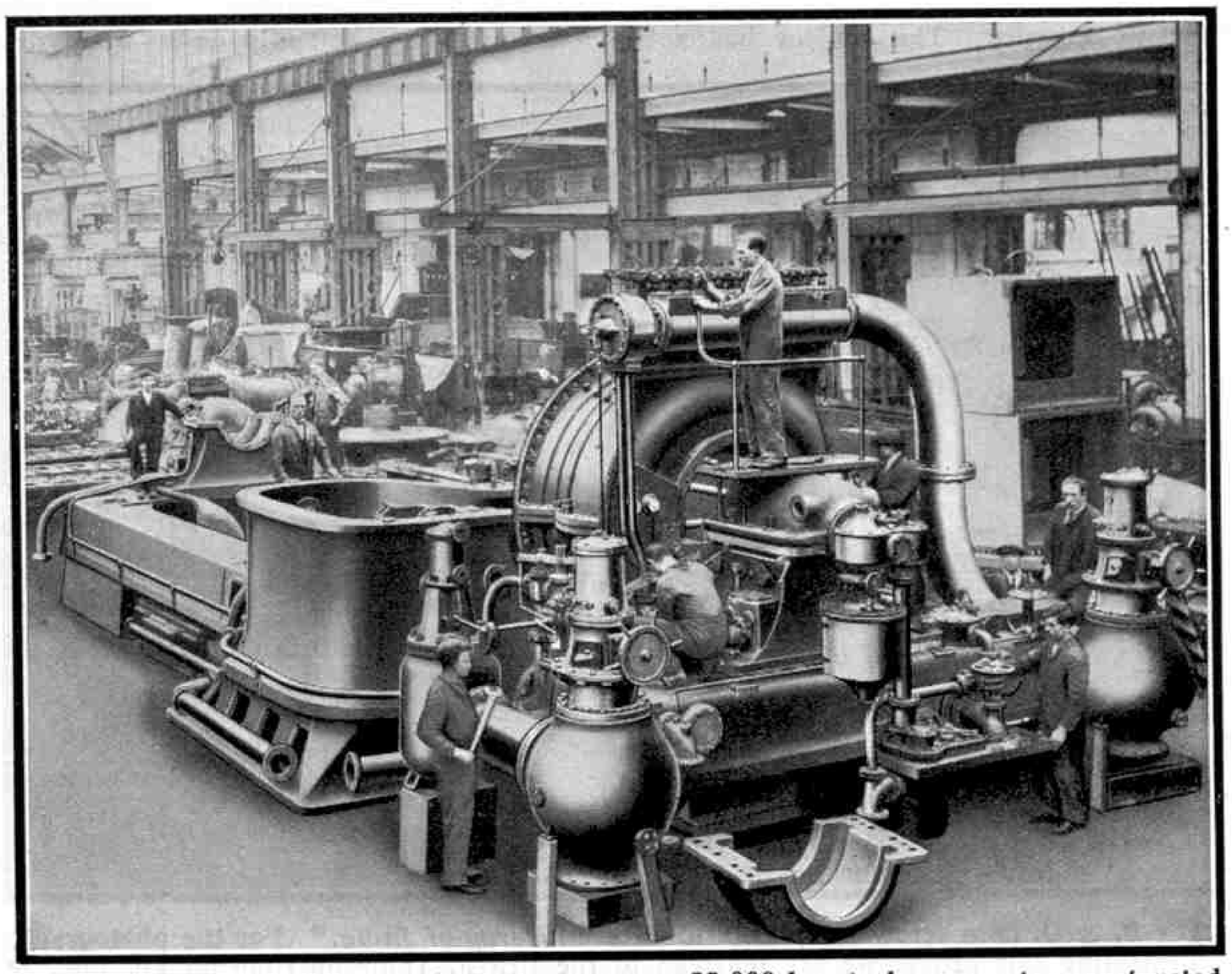


S. Z. de Ferranti, D.Sc., M.I.E.E., the founder of the well-known firm of Ferranti Ltd. While only 18 years of age, Dr. Ferranti's inventions in connection with alternators completely altered their design. In 1910-11 he was elected President of the Institution of Electrical Engineers, the greatest honour that can be paid to an electrical engineer

higher than those received by boys serving their time in Mechanical Engineering. A trade apprentice receives from 8/– to 12/– per week at the beginning of his career, and at the age of 20 the wage may be between 20/– and 30/– per week, exclusive of the special awards already referred to, which may vary from 1/6 to 4/6 per week.

Engineering apprentices—those in the second of the three grades of apprenticeship—undergo a much more liberal training in Electrical Engineering. They are recruited from the ranks of boys who have received a good education at a secondary or public school, and must produce evidence that he has passed the Matriculation Examination or one that is equivalent. A boy who wishes to take up an apprenticeship of this kind must be under 18 years of age, and he retains the status for five years, or until he is 21 years of age, whichever is the longer period.

At the beginning of his career an engineering apprentice spends a period of six months in the apprentice department. This is followed by a further six months in the machine and turning shops, and a year in the fitting and assembling departments. His progress is carefully watched and at the end of this period he is placed in one of two classes into which all the engineering apprentices are divided. The first of these is composed of those who have shown aptitude in purely mechanical work, and the second of apprentices who seem to be more at home on the electrical side. For these two classes different courses of further training are provided.



Group of erectors building up for test purposes a 33,000 kw. turbo-generator constructed by the British Thomson-Houston Co. Ltd. For permission to reproduce this photograph we are indebted to British Thomson-Houston Co. Ltd., Rugby

Mechanical apprentices pass through the production, inspection, mechanical testing or measuring rooms, and the power house or millwright department, spending a period of six months in each shop. Finally comes twelve months' work in the outside construction department, this bringing the apprentice to the end of his training.

Those who have chosen to take up the electrical side of the work are termed electro-mechanical apprentices. They begin the specialised portion of their training with periods of six months each in the wiring and maintenance shop, the production or inspection department, and the drawing office. Their course is completed by working 18 months in the testing department, in which they have opportunities of rounding off the knowledge acquired in the other departments passed through. Further opportunities for specialisation sometimes occur. For instance, an apprentice who wishes to make a speciality of magneto work, and is likely to benefit by it, receives 18 months special tuition in this particularly interesting occupation.

Engineering apprentices are required to further their technical knowledge by attending Evening Classes at a Technical School, and they are expected to study with a view to obtaining the degree of B.Sc. (Engineering) of London University, which offers degrees for those who are unable to attend the usual University courses; or for the National Certificate. Any boy who shows exceptional ability may be allowed to take up a full time college course, and to return to the works as a student apprentice. This greatly enhances his prospects of promotion to an important and responsible position, and an apprentice who wishes to make a success of his career will seize eagerly upon an opportunity of this character.

During his first year of training an engineering apprentice receives from 10/– to 14/– per week, and at the end of his five years' course will be in receipt of from 21/– to 27/– per week.

The student apprentices form the third class with which we have to deal. Their number is limited and the standard of education required is high, for a University degree in Electrical Engineering is a necessary qualification. For any boy who is in a position to afford the time and money required, this course offers by far the best means of becoming an Electrical Engineer, for without the thorough and intensive training received by a student apprentice it is a very difficult task to obtain one of the higher and more remunerative posts in the Electrical industry. Electrical Engineering is based upon the science of electricity and magnetism, and an engineer who does not possess a deep knowledge of this rapidly developing branch of science is quite unable to grasp the inner meaning of the operations with which he is called upon to deal.

By dint of sheer hard work and intensive evening study a young man who has not attended the University may rise to high rank in the profession. As we have seen, an engineering apprentice may succeed in obtaining the opportunities and privileges of a student apprenticeship, but such cases are rare.

An excellent example of a student-apprenticeship system is that of the British Thomson-Houston Co. Ltd. The course lasts three years and the firm allows a student not in possession of a degree or diploma to take it up if he can produce evidence that he has completed a full course of technical training at a University or Technical College. In the first year six months are spent in the machining and turning departments, and six months in the fitting and assembling shops.

Subsequent training depends on the ultimate aim of the apprentice. If he wishes to specialise in research he commences his second year with six months in the research testing shop, and spends the rest of his time on special research work. Electrical student apprentices spend equal periods of time in the four shops where control gear, D.C. machines, A.C. machines, and turbines and rotary converters are tested; while those who intend to take up the electro-mechanical branch of their profession pass through the testing and inspection or production shops in addition to the winding, estimating and repair departments, and the drawing office.

A practice that is becoming increasingly popular is that of admitting Secondary and Public School boys into the works for a short period before proceeding to a University in order to obtain an Engineering degree. For instance, this plan is favoured by the Metropolitan-Vickers Electrical Co. Ltd., of Manchester, for it gives a boy works experience that will be valuable to him in his theoretical studies. During the year spent in the works in this manner special lectures usually are arranged in order that the theoretical side of Electrical Engineering may not be neglected.

Certain firms are prepared to accept pupils for what may be described as "a sandwich course of training," alternate periods being spent in the works and at a recognised University or Technical College. This plan has great advantages, notably in the increase of interest due to variety and works experience, but many firms consider that switching from University to works and back again makes things more difficult for the student.

It should be noted that the British Thomson-Houston Co. Ltd. take special drawing office and chemist apprentices in addition to those of the grades already referred to. These follow courses planned to qualify them for the work of a special character carried on in the two departments.

An interesting point is that to-day very few firms ask apprentices for a premium. The well-known firm of Ferranti Ltd. go further than this and have no regular apprenticeship system, recruiting members of their staff chiefly from boys (*Continued on page 960*)

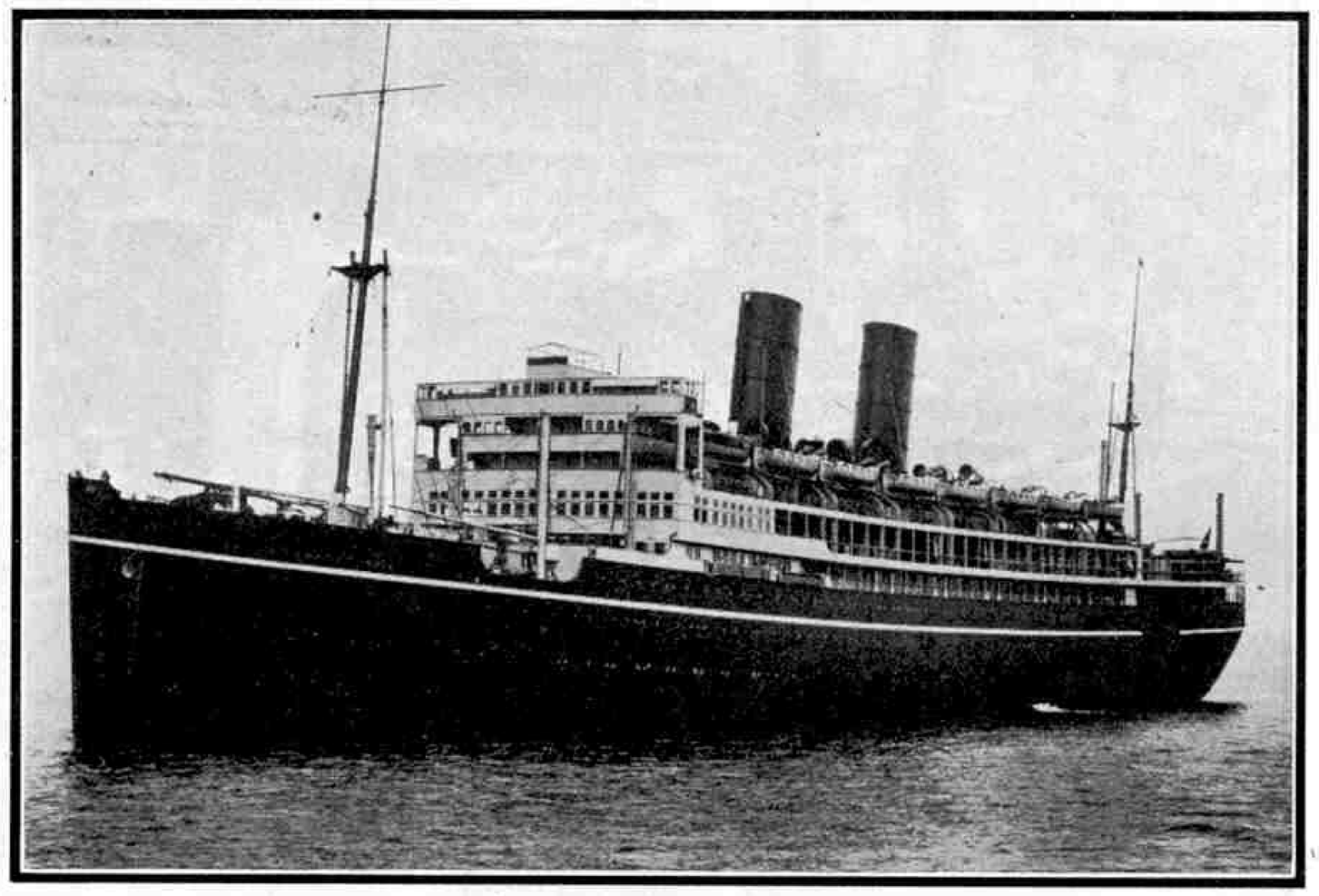
First British Turbo-Electric Liner

The P. and O. "*Viceroy of India*"

IN the "*M.M.*" of July last we published a detailed account of the new U.S. turbo-electric ships "*California*" and "*Virginia*," and mentioned that developments in turbo-electric propulsion have been largely confined to America. The subject has not been neglected by British shipbuilding firms, however, and the first large British vessel to be equipped with turbo-electric machinery has been completed recently.

This ship, named the "*Viceroy of India*," has been constructed by Alexander Stephens & Sons Ltd., of Glasgow, for the Peninsular & Oriental Steam Navigation Co. It has an overall length of 612 ft., a width of 78 ft. and a gross tonnage of 19,070.

Comfortable and thoroughly up-to-date accommodation is provided for 415 first-class and 258 second-class passengers, and it has been specially designed to meet the requirements of the "P. & O." Line's Indian and cruising services. A distinctive feature of the vessel is that she is the first passenger ship to have a separate single-berth state-room for each first-class passenger. Sliding doors enable any group of cabins to be used as a single suite, when desired. The general decoration of the cabins is in polished oak and white enamel, while heavy linoleum covers the floors, which consist of a layer of magnesite composition called "Herculoid," beneath which is a layer of bitumen to preserve the underlying steel deck. The second-class accommodation consists chiefly of two-berth state-rooms. Separate quarters are provided for the Indian nurses, or "ayahs," who frequently accompany their European mistresses.



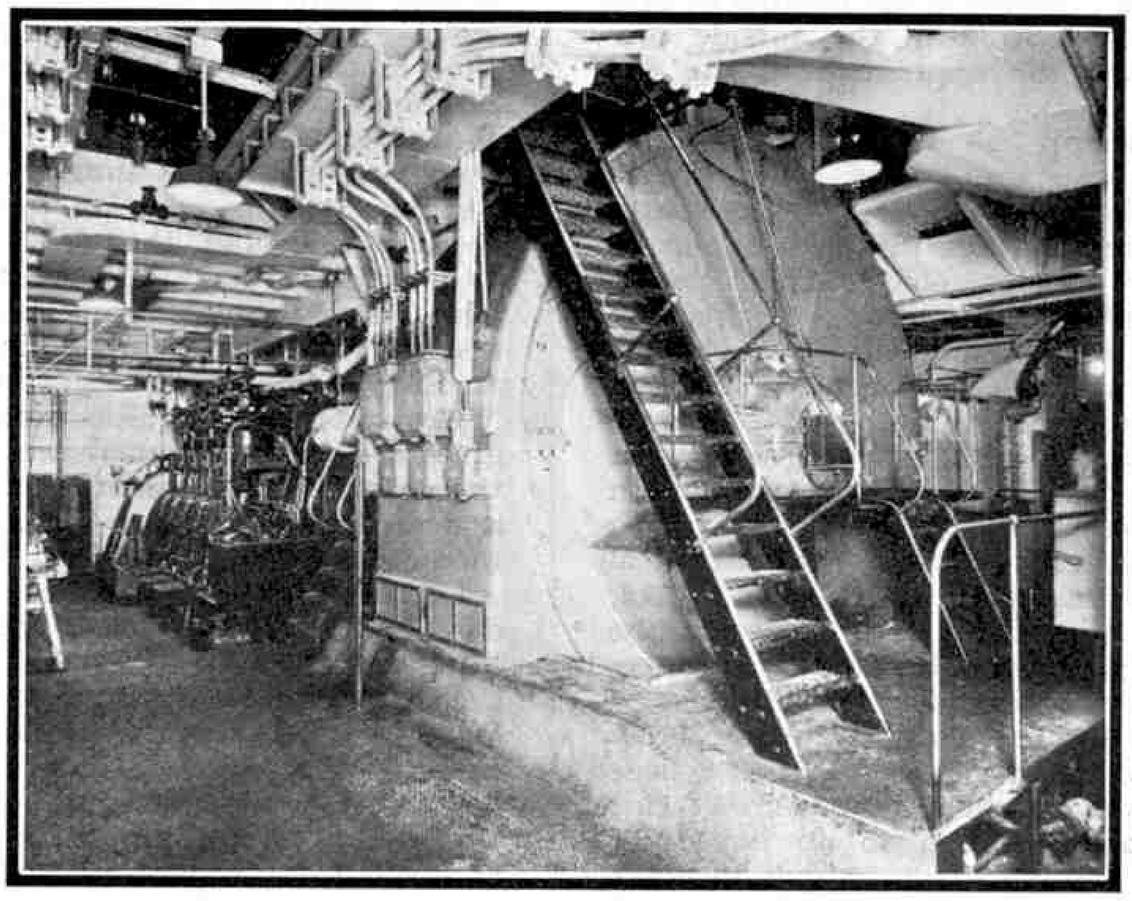
The P. & O. twin screw turbo-electric liner "*Viceroy of India*." For the photographs illustrating this article we are indebted to the British Thomson-Houston Co. Ltd., of Rugby, who manufactured the vessel's propulsion equipment

The passenger accommodation is mainly designed on modern lines, but certain of the public rooms have been designed in the "period" style. One of the most striking of these "period" rooms is the first-class smoking room, the decorative scheme for which has been reproduced from the State-room of the old palace at Bromley-by-Bow that was built for James I, and is now preserved in South Kensington Museum. The room is panelled in English oak, while the oak mantelpiece is engraved with the Royal coat of arms. The room contains a remarkably fine painting showing Shakespeare, in custody for deer stealing, being questioned by Sir Thomas Lucy. To the right and left of the picture are two very beautiful Queen Anne cabinets that have been reproduced from originals in Stirling Castle.

The first-class reading and writing room is an equally distinctive compartment and is panelled in hardwood painted in soft pastel shades. With the exception of the mantelpiece, which is a copy of one at Kedleston, the design of the room has been copied from a room at Harewood House, the home of the Earl of Harewood. Exceptionally large windows render the room airy and light during the daytime, while at night it is illuminated by indirect lighting from four Wedgwood vases.

Another of the "period" rooms is the first-class dining saloon, which is designed in the George I period. This is a spacious compartment, 86 ft. in length and extending the full width of the ship, and the walls are panelled in English walnut. Practically all the first-class passengers can be accommodated at one sitting in this handsome and well ventilated saloon.

The second-class dining saloon is designed and furnished in the style of the Queen Anne period, and has oak panelled walls and furniture to match.



One of the propeller motors, and in the background one of the Diesel engine-driven auxiliary d.c. generators

Other features of the passenger accommodation are comfortably furnished writing and music rooms, children's recreation rooms, a first-class verandah cafe, and a Roman swimming bath.

Eleven transverse water-tight bulkheads divide the ship into 12 compartments, and where these are pierced water-tight doors are fitted, all being electrically controlled from the bridge. A cellular double bottom, extending the length of the ship between the peak bulkheads, is sub-divided into compartments that are utilised for the storage of water ballast, fresh water, and oil fuel. Additional oil fuel storage is provided by large tanks situated in the boiler rooms.

The steering gear is of the electro-hydraulic type, and is controlled from the navigating position by means of telemotor gear. The equipment of the navigating bridge includes a gyroscopic compass and the latest types of docking and steering telegraph apparatus. The navigating equipment includes a powerful 20 in. dia. searchlight projector of 16,000 candle power. The patent mirror of the projector can be adjusted to give different

kinds of beams, including the flat beam of light with a dark central interval that the Suez Canal authorities require to be used when approaching other vessels passing through the canal.

Ventilation is a matter of the greatest importance in a ship that is intended to cruise in tropical waters, and the ventilation equipment of the "*Viceroy of India*" includes no less than 106 power driven fans. The methods adopted for ventilating the ship include a patent "punkah-louvre" system that is installed in the officers' and crews' quarters; the galleys, baggage and store rooms; the numerous state-rooms and, with the exception of the first-class dining saloon, in all the public rooms. A feature of the system is that the air can be completely renewed every three minutes. The louvres in the state-rooms include a shutter arrangement that enables passengers to regulate the air supply as they desire. In the first-class dining saloons a louvre is provided for each chair, and a complete change of air can be effected every minute.

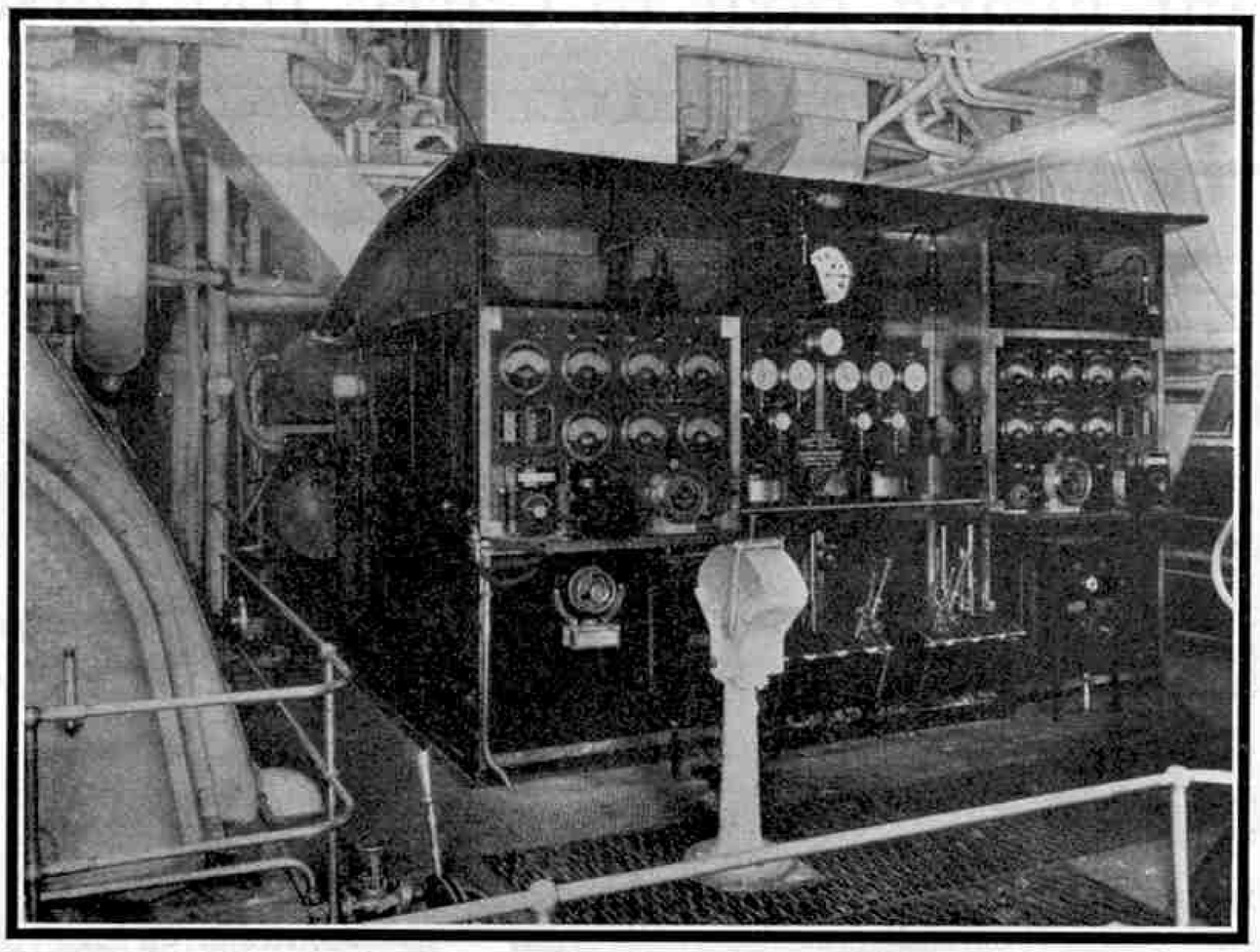
Ample life-boat equipment is carried and includes 13 boats each 30 ft. 10 in. in length; one 28 ft. motor life-boat and two 26 ft. emergency life-boats. The boats are slung from "Welin" type davits on the boat deck, and are carried well above rail height so that passengers have an unobstructed view from the deck and can promenade right up to the ship's sides. The ship is provided with a powerful wireless installation. In addition one of the life-boats is equipped with wireless apparatus.

The "*Viceroy of India*" is designed to carry considerable quantities of general and refrigerator cargo, in addition to her complement of passengers. There are six large hatchways to accommodate merchandise, while steel derricks have been erected at convenient points on deck to handle the cargo. The facilities for handling refrigerator cargo include two special cargo spaces each insulated with several layers of sheet cork covered with expanded metal, over which a coating of special cement has been laid. An advantage of this system is that the compartments can be washed by hoses or steamed-out without damage to the insulation.

The refrigerator plant includes two vertical twin-compressor carbon-dioxide machines each coupled direct to an Austin 45 b.h.p. constant-current variable-voltage motor. There are two condensers and evaporators, together with a centrifugal water pump and three centrifugal brine pumps, one of which is designed to deliver the brine at high pressure to several cold storage cupboards on an upper deck. An air cooler installed in the thawing room supplies ventilation to the provision chambers.

The propulsion equipment of the "*Viceroy of India*" was manufactured by the British Thomson-Houston Co. Ltd., Rugby. The main propelling machinery consists of two 3-phase turbo-alternators each rated at 9,000 k.w. at 2,690 r.p.m. The alternators are of the air cooled type, the air being forced in a closed circuit through the stator and rotor, after which it passes through a cooler that is immediately below the alternator frame. Each alternator is provided with its own condensing plant and auxiliaries, and supplies current to one of two synchronous propulsion motors each rated at 8,500 s.h.p. at 109 r.p.m.; and these in turn are coupled direct to the twin propeller shafts.

At reduced powers one turbo-alternator only is required for supplying current to both motors, the second turbo-alternator standing in reserve. Maximum economy in fuel both at full and reduced power is thus obtained, which is a great advantage in a vessel that accomplishes part of her voyage at less than the maximum speed and power. The reserve power can be quickly brought into use when heavy weather is encountered. The alternators always rotate in the same direction and, with both in operation, the speed and direction of either propeller may be varied irrespective of the other. When one alternator is used for driving both propulsion motors both operate at the same speed; they may, however, be rotated in the same or in opposite directions.

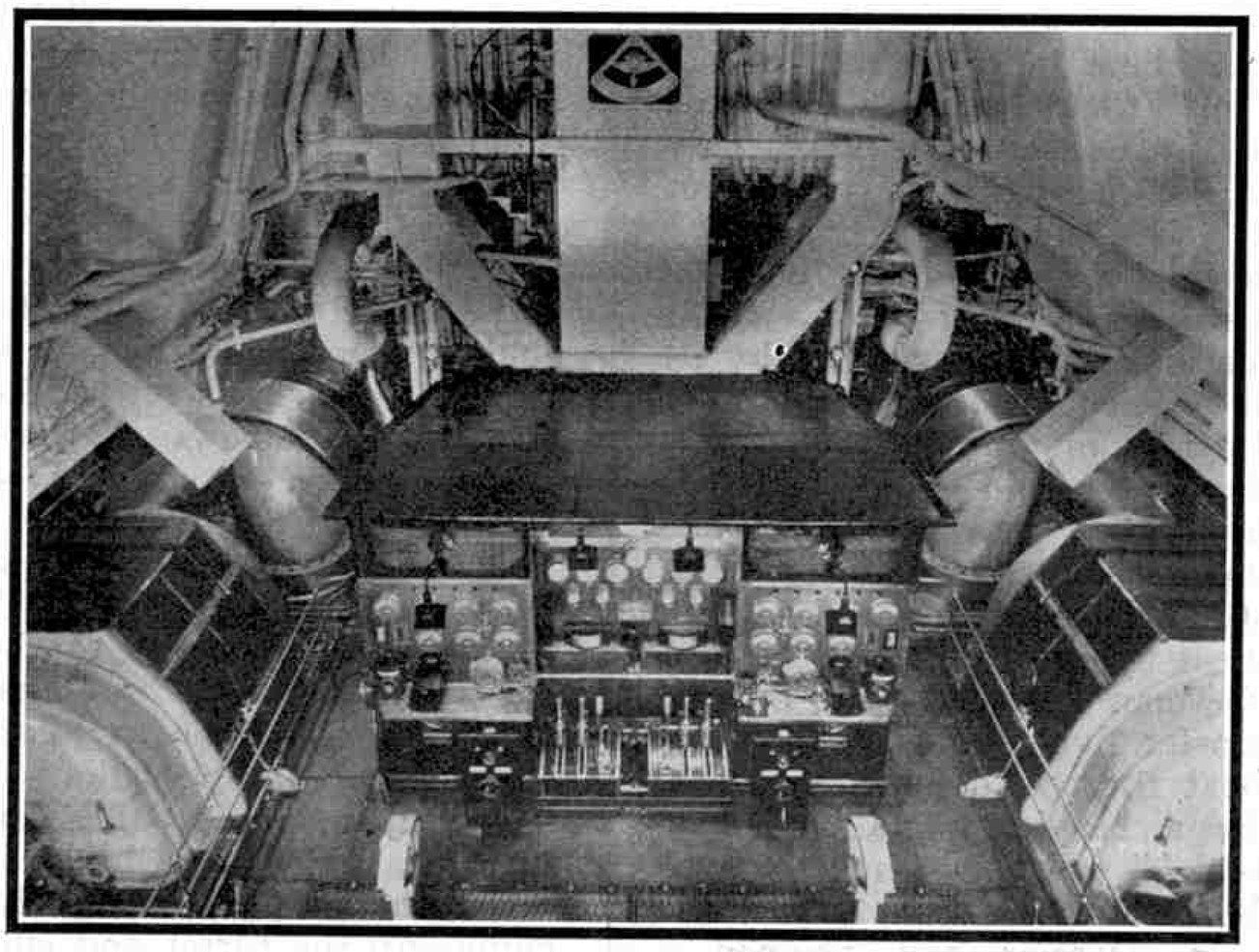


The main control board: a fine example of electrical and mechanical concentration

The controls are interlocked so that damage cannot be done by an unskilled operator to any portion of the equipment when manœuvring. At the same time indicating instruments are provided by means of which an intelligent operator can carry out orders in a very short space of time with a minimum of manual effort.

Steam for the main turbines is supplied at a pressure of 350 lbs. per sq. in. by six "Yarrow" oil-fired water-tube boilers, two in the forward stokehold and four in the aft stokehold. The boilers in the aft stokehold have a total capacity sufficient to enable the forward stokehold to be entirely closed down when the ship is steaming at 16½ knots, as only one turbo-generator is then required. Two oil-fired cylindrical Scotch boilers are situated in the forward stokehold and these supply steam at 230 lb. per sq. in. pressure to the auxiliary generators.

The air required for forced draught is supplied by six fans driven by Austin constant-current motors having a large range of speed. All oil fuel plants, including pumping and heating units, transfer pumps and filters, are placed in two separate pump rooms situated between the forward and aft stokeholds. The oil fuel pumps are electrically operated. A total quantity of 2,300 tons of oil fuel can be carried in the 22 tanks that surround the boiler compartments. These tanks are filled from a central station on each side of the ship, and the quantity of oil in each tank may be measured at any time by means of mercurial gauges.

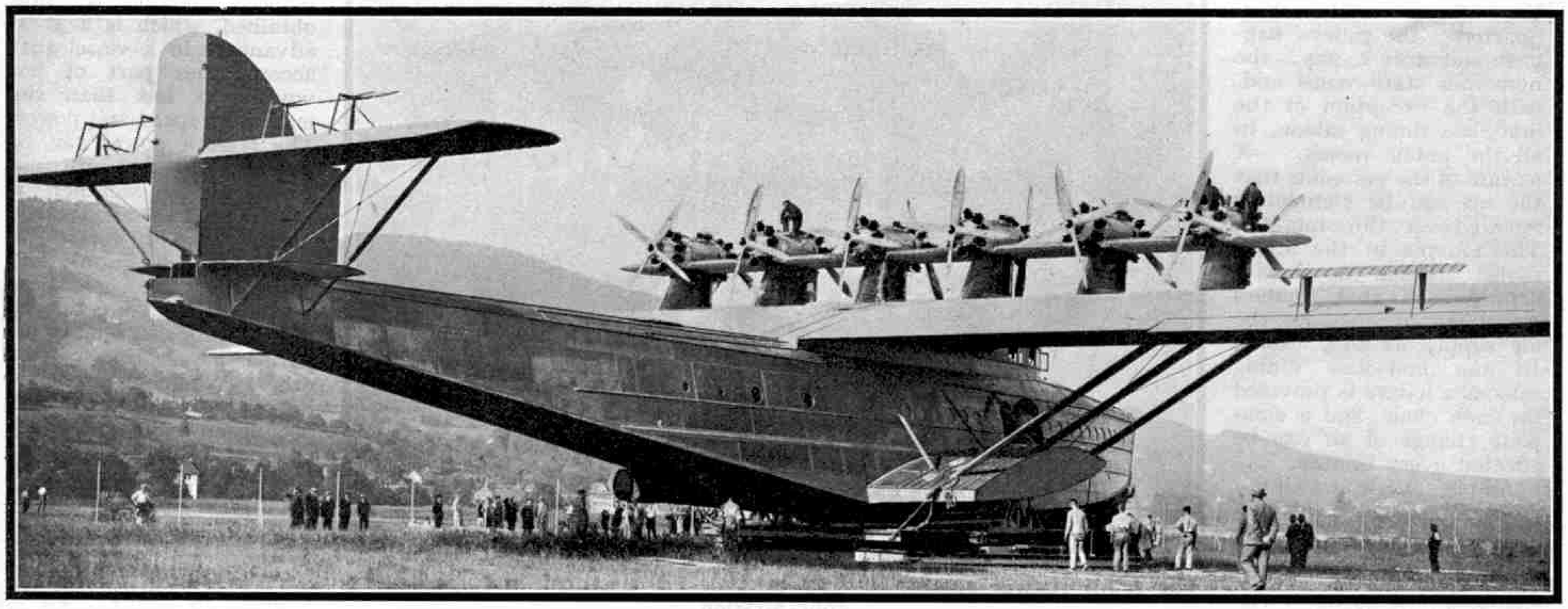


The main turbo-alternators, and another view of the control board

Feed water for the "Yarrow" boilers is supplied by two Weir steam turbine driven pumps each capable of delivering 20,000 gallons per hour. Any loss of feed water is made up from fresh water in the double bottom tanks, which is purified by being evaporated in a low pressure evaporator. (*Continued on page 939*)

The "DO.X"—A Leviathan of the Air

Giant Flying Boat to Carry 160 Persons



The Dornier "*DO.X*," the world's largest flying boat, on the slipway. We are indebted to the builders, the Dornier Metallbauten G.M.B.H., for permission to reproduce this and the other photographs illustrating this article

ON 21st October of this year the world of aviation was startled to learn that a "heavier than air" machine carrying no less than 169 people had made a flight of practically one hour's duration. The machine that performed this record-breaking feat is a huge 12-engined flying boat built by the Dornier Metallbauten G.M.B.H. of Friedrichshafen, Germany. The flight was made over Lake Constance, which already had become famous as the scene of the trials of Count Zeppelin's rigid airships.

The number of people on board the flying boat on this occasion easily constitutes a record for a flight in either an aeroplane or an airship, exceeding by 94 the number of persons carried on the preliminary flights of the great British airship "*R.101.*" The crew of the boat numbered ten and there were 150 passengers. The remaining nine were the inevitable stowaways, without whom it now seems impossible to make any flight of historic importance!

The designer of this great flying boat is Dr. Claudius Dornier, a well-known German engineer. Dr. Dornier had previously built monster flying boats, and before the flight of his latest boat the record for the number of passengers carried by a heavier-than-air machine was held by the "*Super-Wal,*" which has made a flight with 60 passengers on board.

The rumours that Dr. Dornier had planned a "leviathan of the air" that would carry twice as many passengers as the "*Super-Wal*" had been greeted with scepticism, and some doubt of the ability of such a machine to rise from the water had been expressed. To a certain extent its designer also was a little uncertain. He was confident that eventually the great flying boat would be a success, but so many unknown factors were involved in its construction that to it he gave the name of "*DO.X.*" The first two letters are a contraction of his own name, and the "X" is the familiar algebraic symbol for an unknown quantity. Thus a literal rendering of the name by which the machine now is widely known is "Dornier's Unknown!"

As will be seen from the illustrations the machine is a monoplane. Immediately above the main plane is a smaller auxiliary aerofoil, which connects and supports the six nacelle turrets in which the engines are carried. The latter are "Jupiters"—a type that has brought and is bringing much fame to its British designers. There are twelve engines in all, developing a total of 6,300 horse power. They are placed in pairs end to end in the six nacelles, a form of distribution that is remarkable, for the six in front operate four-bladed tractor airscrews, while those behind are connected to airscrews of the pusher type. The fuel and oil tanks are situated on the lowest deck of the machine, and with full tanks and a complete crew the weight of the flying boat is about 35 tons.

An interesting feature of the machine is that minor alterations and repairs to the engines may be carried out while the boat is actually in the air. When a mechanic receives orders to attend to one of the engines that appears to be failing, he lies down on a small trolley that runs on rails laid inside the wing of the machine, and propels himself along until he is directly under the nacelle carrying the faulty engine. He then climbs up the turret and effects the necessary repairs, afterwards returning to the engine control room on the trolley to report to the engineer in charge.

The main body of the "*DO.X*" is of enormous size and has three decks. On the top deck is a cockpit for the two pilots and immediately behind this is a well-equipped navigation room. Thus the front part of the top deck may be regarded as equivalent to the bridge of an ocean-going liner. The engine control room, wireless cabin, and a room for mail also are situated on this deck.

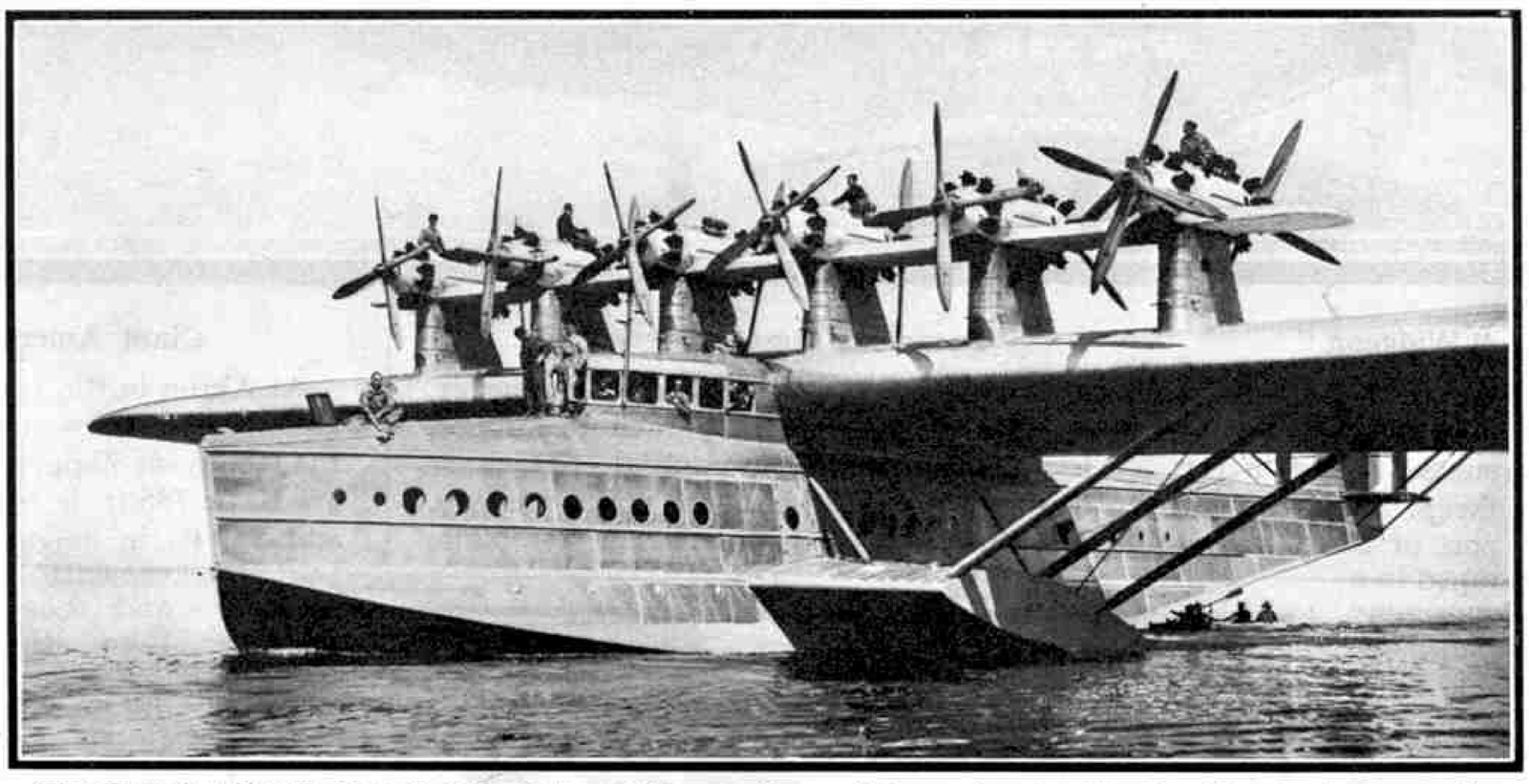
Naturally a flying boat of such immense size cannot be controlled as easily as one of the ordinary type, and the *"DO.X"* therefore carries a crew of 12 men. This includes the captain, his assistant or first mate, two pilots, an engineer, four mechanics, a wireless operator, a cook and a steward. While in actual flight the boat is in charge of the captain, and the pilots merely act under his instructions exactly as the quartermasters of Atlantic liners follow those of the officer in charge.

Passengers are accommodated on the middle deck. This contains a large lounge that is equipped with comfortable detached cushion chairs, and it is interesting to note that a wireless receiving outfit, complete with loud-speaker, is provided for the amusement of the passengers. The cabins also are situated on this deck. These are fitted up for 72 passengers, and it is intended to make this the maximum number to be carried on long flights. On flights of short duration the number may be increased and, as we have seen, the *"DO.X"* has accommodation for no fewer than 160 passengers in addition to the crew. In the bow there is a roomy smokeroom complete with bar, and the aft portion of the middle deck is occupied by cloakrooms, pantry and kitchen.

In the interests of the comfort of passengers efforts have been made to lessen the noise of the engines, and even in the earliest flights of this leviathan of the air it was noticed that the noise in the interior of the boat was not excessive. Further experiments are to be carried out in order to reduce this further, and to ensure that conversation between passengers may be carried on in an ordinary tone. At present passengers in airships are better situated in this respect, and generally accommodation on lighter-than-air vessels in more luxurious than on aeroplanes and flying boats. To many of the passengers in the *"DO.X"* the privilege of smoking no doubt will compensate for other deficiencies!

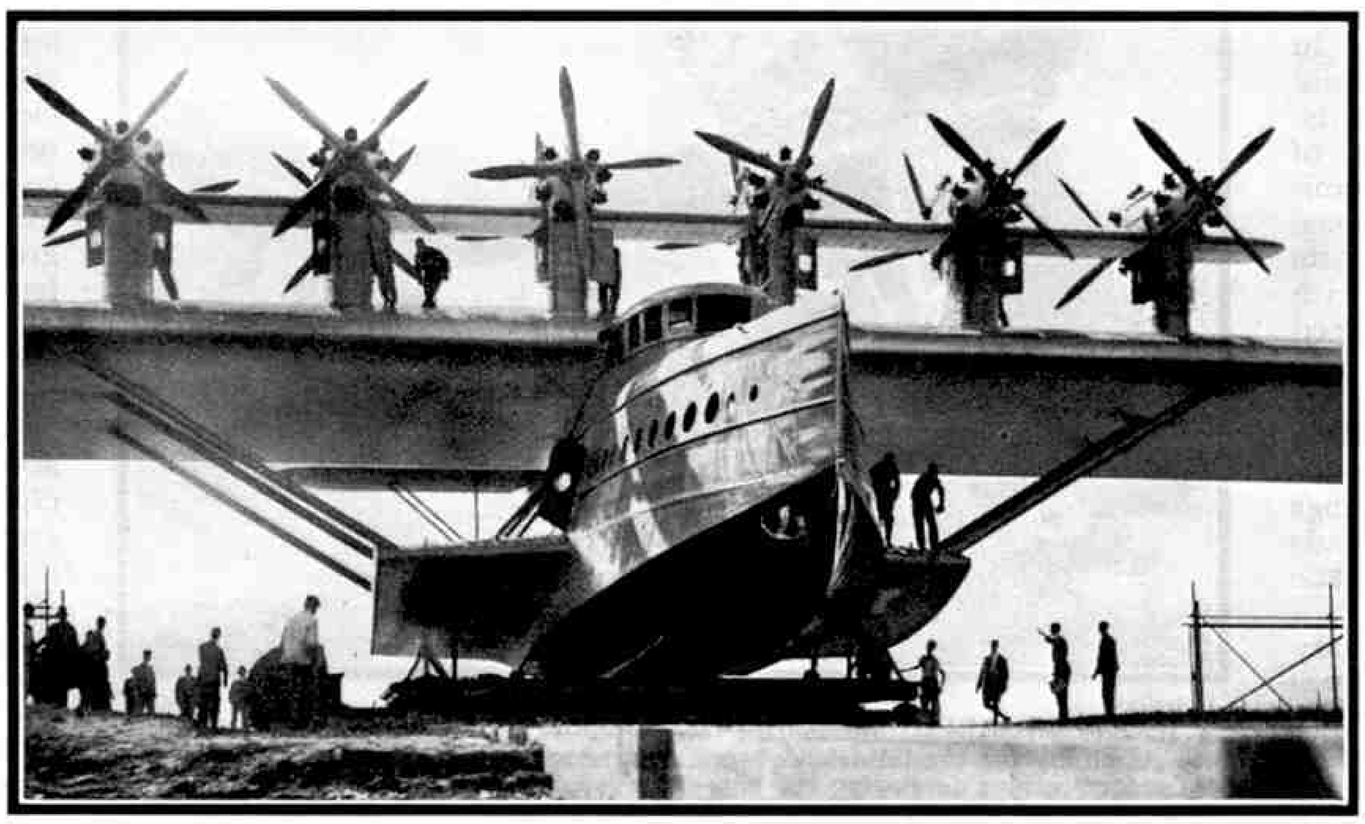
Electric lighting is provided throughout the machine, the current being generated by an auxiliary engine developing 4 h.p. This engine also provides the necessary current for the wireless outfit, the pumps and the engine-starting apparatus.

The giant flying boat was given a thorough trial over a period of ten weeks, during which 30 flights were made. Dr. Dornier was quite satisfied with its performance, and apart from trifling adjustments to the compensating surfaces of the rudder practically no modifications in design were necessary.



The Dornier "*DO.X*" in the water, with members of the crew standing by the engine nacelles

After several flights it was found that the rear engines were insufficiently cooled. This was a minor trouble and had not been unexpected, for never before had engines been carried in a similar position on a flying boat of this size, and the designer had little experience to guide him. A series of experiments were made in order to ascertain the manner in which the airstream passed around the cylinders of the rear engines, and the information obtained was sufficient to enable changes to be made in order to direct a cooling stream of air on them. This reduced their temperature to the correct level.



Putting the finishing touches to the giant Dornier flying boat prior to the launching ceremony. This view gives a good impression of the size of the machine

In spite of its size and weight the *"DO.X"* is said to be extraordinarily responsive to the pilot's touch. In anticipation of some difficulty in controlling the machine servo-motors had been provided, in order to minimise the strain on the pilot, but these proved to be quite unnecessary.

The *"DO.X"* already has some remarkable feats to its credit. Full details of its performance are not yet available, but on Lake Constance, with a total load amounting to 45 tons, it has taken off in little more than 60 seconds. The Lake is at an altitude of about 1,312 ft. above sea-level, and there is little doubt that from the latter, the machine would rise easily with loads of at least 52 tons, owing to the denser atmosphere.

During the trials the maximum speed attained was about 134 m.p.h., and it was found that the *"DO.X"* is capable of maintaining level flight *(Continued on page 960)*

The Westland "Widgeon"

The Westland "Widgeon" two-seater light monoplane has been designed with especial regard to strength, safety in the air and simplicity of upkeep. The machine has a normal wing span of 36 ft. 4½ in., but when it is to be garaged in a limited space, the planes may be folded alongside the fuselage, thus reducing the width to 12 ft. The folding operation is as easy as putting down the hood of a motor car and may be carried out by one person.

For the most part the monoplane is of metal construction, and is strongly built in order to enable it to stand up to hard regular service. The fuselage is constructed on similar lines to those of the Westland Military Aircraft, and the ailerons—which extend the whole length of the wings—the rudder, fin and elevator are also of metal. There are no rigging wires to keep in correct tension, the main planes being braced by steel V struts.

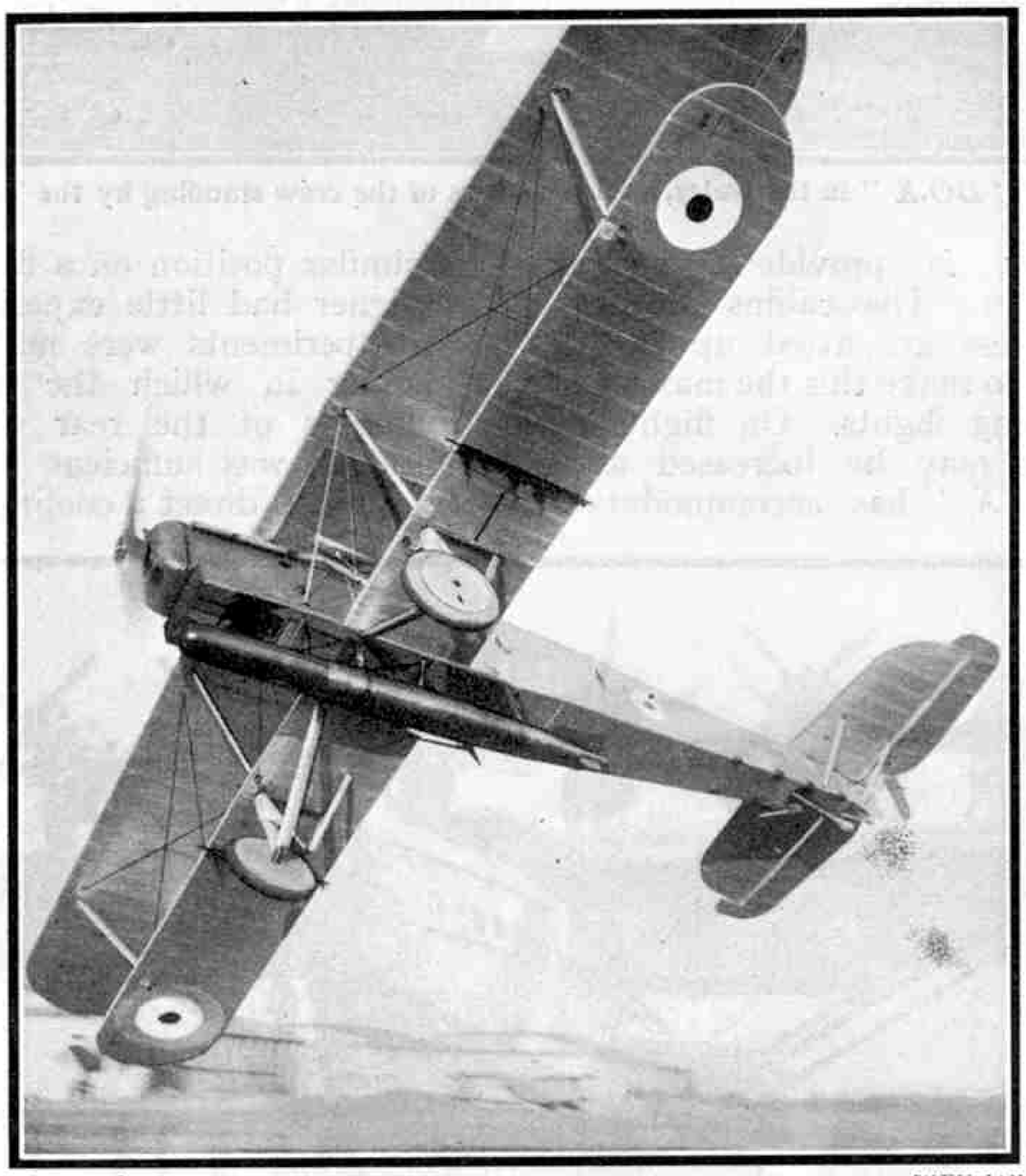
The sturdy construction of the "Widgeon" makes it eminently suitable for use overseas. Other features that add to its value under conditions met with in comparatively undeveloped countries are a wide track, divided axle, and an undercarriage that provides a large clearance. The machine stands up with ease to heavy landings on uneven surfaces, for the loads are well distributed over the longerons of the fuselage.

Pilots of the "Widgeon" may indulge safely in all the usual aerobatics, for the machine is naturally stable and possesses a high factor of safety. Wing slots are unnecessary, but if desired may be fitted as an extra. The machine holds the British Air Ministry's Aerobatic Certificate of Airworthiness. This was granted for a loaded weight of 1,450 lb., but the weight for normal flight is 1,650 lb.

The monoplane is equipped with a "Cirrus" Mark III engine, and has a maximum speed of 104 m.p.h. Its cruising speed is 86 m.p.h. and the landing speed 46 m.p.h., while it possesses a climbing rate of 650 ft. per min. The cockpits for pilot and passenger are roomy and comfortable and give excellent views, and the monoplane may be fitted with dual controls for training purposes.

Parachute Descent Broadcast

A short time ago Mr. Henry Bushmeyer, a well-known American parachute jumper, broadcast during an actual parachute descent a description of his aerial journey. Mr. Bushmeyer dived from an aeroplane flying at an altitude of about 3,000 ft., and by means of a small portable short-wave transmitter strapped on his back was able to give listeners an account of the sensations he experienced. His talk was relayed from a chain of broadcasting stations that covered the whole of the United States.



Courtesy] ["*Flight*"

A Hawker "Horsley" torpedoplane at speed. This type of machine is used by the Admiralty for coastal defence work, and is equipped with a single Rolls-Royce "Condor" engine developing 700 h.p. It is capable of carrying a torpedo weighing 2,000 lb.

New French Record

A new record for distance flown in a straight line in a machine weighing less than 440 lb. has been set up by M. Fauvel, who flew in a Maubossin monoplane from St. Inglevert to Pau, a distance of about 528 miles, in 7 hours 20 mins.

Giant American Airships

At Akron in the United States two giant airships are now being constructed by the Goodyear-Zeppelin Corporation. They are to be 785 ft. in length, 133 ft. in width and 146 ft. in height. Each will have a capacity of 6,500,000 cu. ft., and thus they will be larger than the British airships, "*R.100*" and "*R.101*," which are capable of holding 5,000,000 cu. ft. of gas.

When completed these vessels will be the largest and most powerful airships in the world. It is expected that with a full load their cruising range will be more than 5,000 miles, and thus the double journey across the Atlantic Ocean without landing or refuelling will be well within their capacity. Naturally the shed in which the new airships are being constructed also is of record size. It is 1,200 ft. in length, 325 ft. in width and 200 ft. in height, and is sufficiently large to accommodate both airships, which are being constructed side by side. A full description of the shed was given on page 386 of the May issue of the "*M.M.*"

It is interesting to learn that the airships are being built on lines similar to those of the "*Graf Zeppelin*," and not in accordance with the new principles employed in the construction of "*R.100*" and "*R.101*." They will be filled with helium, a gas that is heavier than hydrogen, but possesses the great advantage that it is not inflammable. America practically has a monopoly of this gas, and its use will make the airships less vulnerable to the effect of incendiary bullets, which accounted for many lighter-than-air vessels during the Great War. The giant airships also will be formidable in attack, for they will be armed with guns of heavy calibre, and in addition each will carry no less than six aeroplanes, which may be launched from the top of the envelope. It is probable that the airships will be equipped with special apparatus by means of which the aeroplanes again may be taken on board at the end of a flight. The machines then could be employed for a variety of purposes, including scouting, convoy work and attacking and destroying enemy airships.

Aero Engine's Splendid Performance

On 27th December, 1928, a standard De Havilland "Gipsy" engine, selected at random by representatives of the Air Ministry Aeronautical Inspection Directorate, was sealed in such a manner that it was impossible to effect any repairs or adjustments, except routine checking of valve clearances and the cleaning of sparking plugs. The engine was then fitted into a standard D.H. "Moth," which was flown under varying conditions until it had been in the air for 600 hours and had covered a distance of more than 51,000 miles.

Including bench tests and other trials, the actual time during which the engine ran was 661 hrs. 5 min. Ordinary petrol was used throughout, and the consumption was 19½ miles per gallon, while oil was used at the rate of one gallon for 1,400 miles.

At the end of the series of flights the engine was running so sweetly that the makers were tempted to prolong the trial for a further 400 hours. This temptation was resisted, however, and after breaking the seals the engine was dismantled for exhaustive examination. The parts were handed over to the Air Ministry's representatives, who found that the total cost of the necessary replacements and repairs was only £7 2s. 11d. Thus the cost of renewals was only 1d. for each 30 miles of flight!

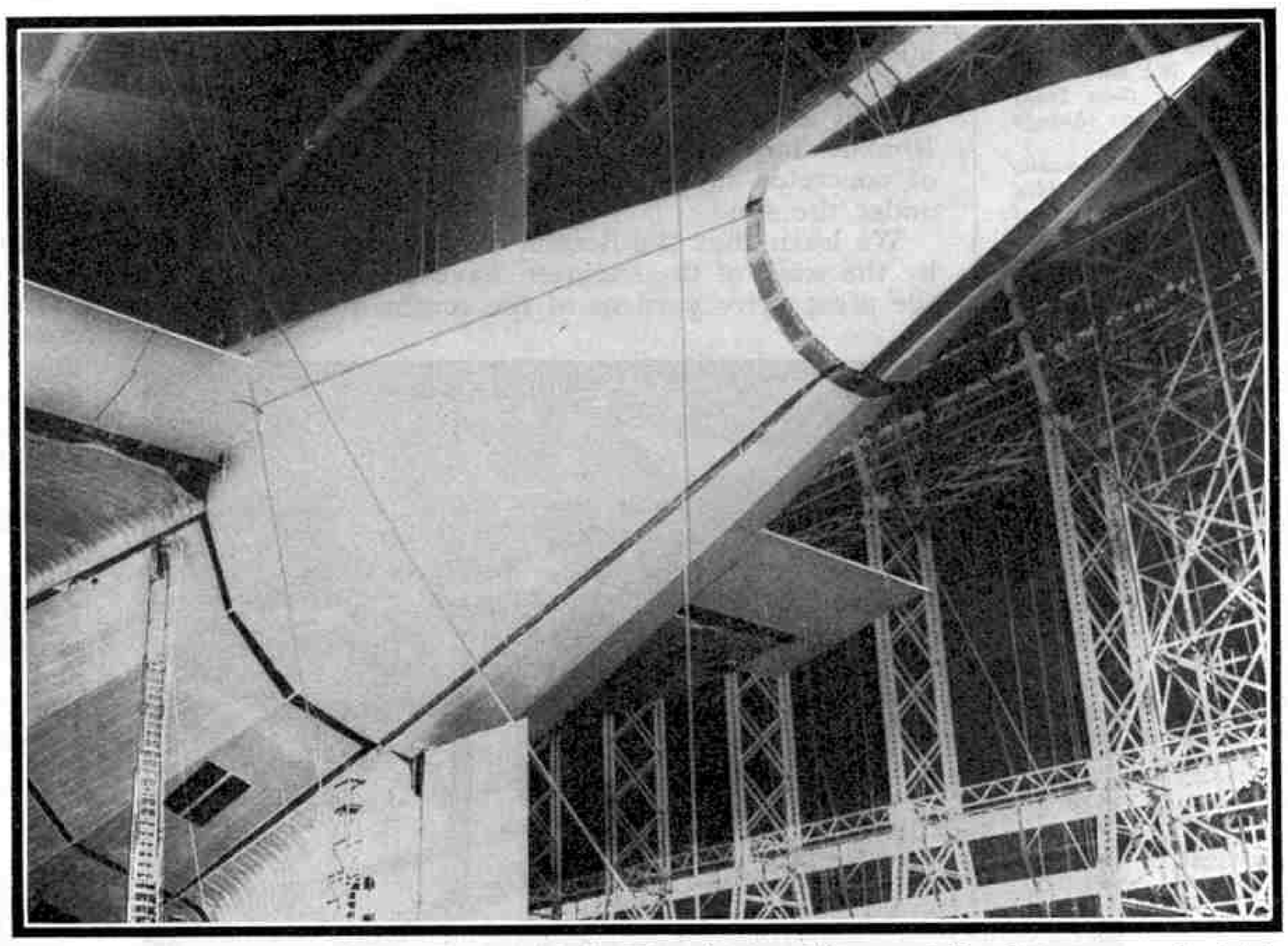
The performance of the engine was not affected to any notable degree, for before the trials its output at 2,050 r.p.m. was 94.7 b.h.p., and on their completion this had fallen only to 92.3 b.h.p. when running at the same speed. The carbon deposit inside the cylinder heads and on the crowns of the piston was less than twelve thousandths of an inch in thickness. The De Havilland Company intend to carry out a series of experiments in order to find means of reducing wear and tear on the few parts that required replacement.

Railway Stations as Aerodromes

One of the great disadvantages of making comparatively short distance journeys by aeroplane is that time is lost in travelling to and from the aerodromes, which are usually situated some distance outside the boundaries of cities. In order to avoid this, it has been suggested that the roofs of railway stations in central positions should be prepared for use as elevated aerodromes. As the only available landing grounds actually within the boundaries of cities usually are public parks, this suggestion is certainly well worth careful consideration by the railway authorities, some of whom are already permitted to use aeroplanes for passenger carrying purposes.

Imperial Veteran Airways' Pilot's Remarkable Record

A remarkable record has been established by Captain A. L. Robinson, one of the veteran pilots of Imperial Airways. Captain Robinson recently completed 6,000 hours' flying, the equivalent of 250 days, or more than eight months, in the air. He started his career 14 years ago at Brooklands and distinguished himself in France with the Royal Air Force. For the past ten years he has been piloting civil aircraft on the cross channel routes. During this period he has crossed the Channel more than 1,500 times and piloted approximately 15,000 passengers.



The finely-pointed tail of the "*R.100*." The giant rudders and fins by means of which the airship is steered and elevated are clearly visible **(see page 946)**

New British Air Line

Survey work for an Imperial Airways air line from Britain to Australia is now being carried out by an R.A.F. Supermarine "Southampton" flying boat. An entirely new route will not be surveyed, as it is probable that the existing London-Karachi air line will be extended to Darwin, in North Australia, via Calcutta, Rangoon and Batavia. The first section of the extension, from Karachi to Calcutta, is expected to be inaugurated in the near future.

Air Mail Liner's Record Flight

One of the air liners engaged in the carriage of Indian Air Mail recently completed the first stage from Croydon to Basle, in Switzerland, a distance of 500 miles, in the record flying time of only 4½ hours. In addition to eight passengers the liner carried a mail of approximately 35,000 letters.

Aeroplane Propelled by Rockets

A successful flight in an aeroplane propelled by rockets has been made by Herr F. von Opel, whose experiments with motor cars propelled in a similar manner were described in the "*Engineering News*" of the "*M.M.*" for July, 1928. This unique aeroplane was launched by means of a trolley, itself driven by rockets, that ran along rails 30 ft. in length. At the end of the track the trolley was stopped by a buffer, but in the meantime the aeroplane had acquired sufficient momentum to enable it to rise, and when in the air it relied entirely upon the rockets with which it was charged for its motive power.

Two futile attempts were made before the machine actually flew. In the air it was not completely under control and eventually crashed to the ground, the pilot sustaining a number of burns, although he had taken the precaution of lining the cockpit with sheets of asbestos. Further attempts at flight on these lines are awaited with great interest.

New Cooling Liquid for Aero Engines

A number of experiments have been conducted by the army authorities in the United States in order to find means of decreasing the weight and frontal area of high power aero engines suitable for use in cases where air-cooled engines cannot be employed. An interesting result has been the discovery that the substitution of a chemical known as ethylene glycol for water as cooling liquid may appreciably improve the performance of an aero engine.

In many respects ethylene glycol is similar to glycerine. Its boiling point is 387°F. This is 175°F. higher than that of water, and thus there is less danger of raising the temperature of the liquid to boiling point by racing or over-working the engine for long periods. The weight carried also will be reduced to a certain extent, for it is stated that one quart of the ethylene glycol is sufficient to replace one gallon of water. Further experiments are to be made in order to give a thorough test of the value of the new cooling liquid.

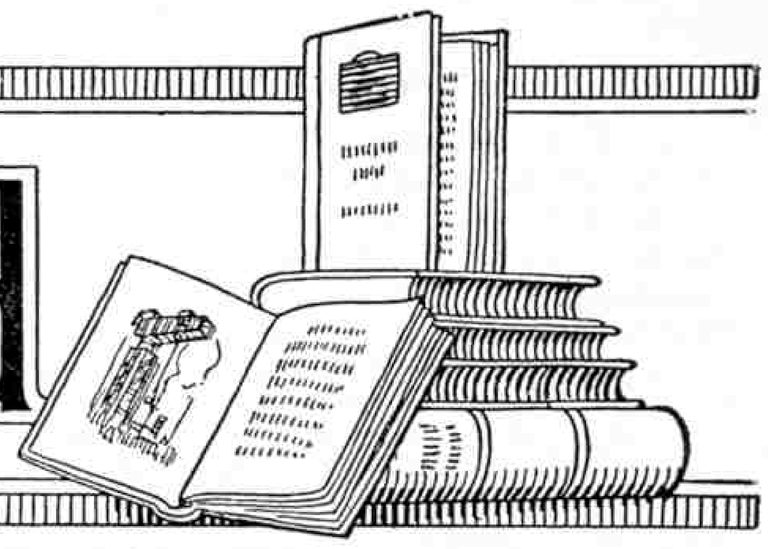
Air Liner for Pearl Business

The Imperial Airways air liner "*City of Cairo*" was specially chartered for a journey from Basra to Bahrein, an island in the Persian Gulf that is the scene of pearling operations. The visit of a modern air liner to this spot, so far away from the usual routes of communication, naturally caused great excitement among the local people. During the afternoon a total of 68 passengers made flights and enjoyed a bird's-eye view of their Island home.

THIS MONTH'S AIR STORY

Father (reading report): "What's the meaning of this? Your headmaster says that you're 'no earthly good!'"
Son: "That's all right, father. I want to join the Air Force!"

Books to Read



On these pages we review books that are both of interest and of use to readers of the "M.M." We have made arrangements to supply copies of any of these books where readers find difficulty in obtaining them through the usual channels.

Orders should be addressed to the Book Dept., Meccano Limited, Old Swan, Liverpool, and 1/– should be added to the published price of the book to cover the cost of postage. The balance remaining will be refunded when the book is sent, as postages on different books vary according to the weight and destination.

"Wonders of Engineering"

By Ellison Hawks
(Methuen & Co. Ltd. 6/–)

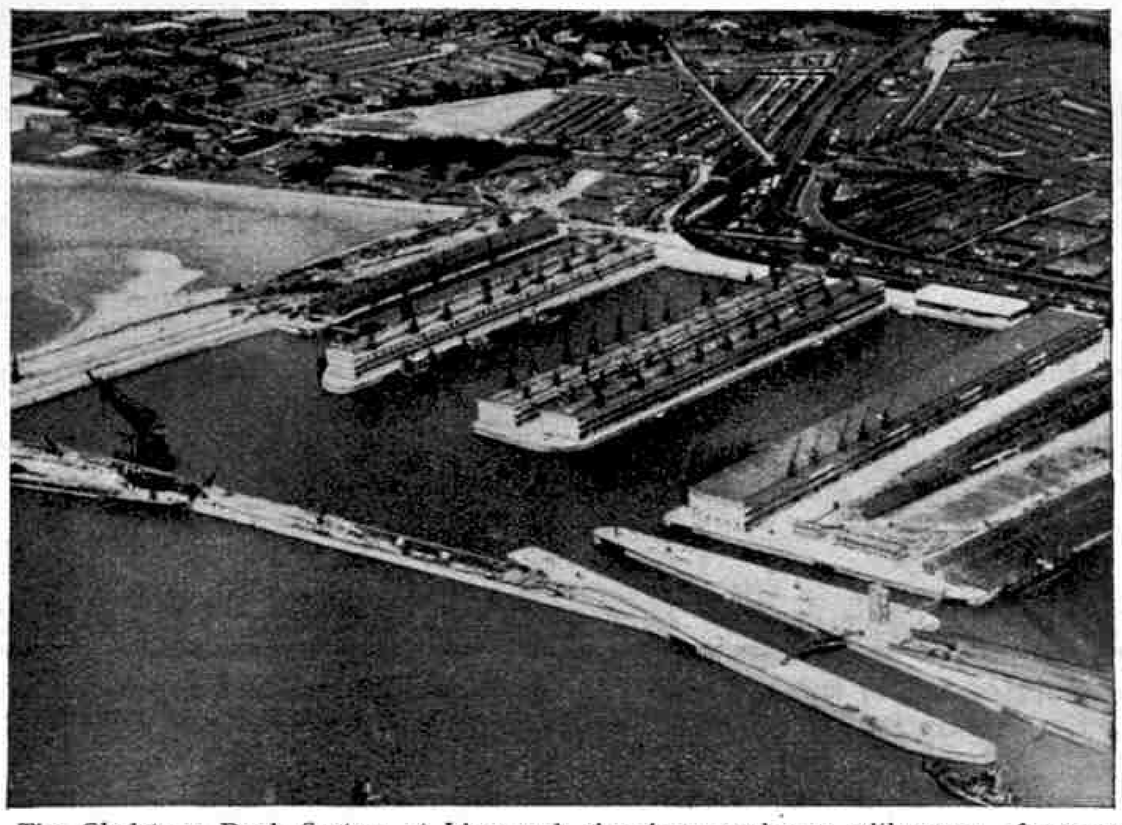
The great variety of the wonders of engineering make the writing of a book on the subject a matter of real craftsmanship, but in this well illustrated volume the author has done this with rare skill. The subjects he deals with include Bridges; Docks; Breakwaters; Cranes; Canals; Harnessing Water Power; the Irrigation of Deserts; and the Tunnelling of Mountains.

He tells us that bridges represented some of the earliest efforts in engineering, for their origin is lost in antiquity. The name "bridge," which is derived from the *brygg* or "gangway" of the Viking ships, persists in the captain's bridge to-day. Bridges began with the first tree that fell across a stream, and Man turned the accident into design by felling trees for the purpose of bridging streams and rivers. Modern bridges are of four types:—arch, girder, suspension and cantilever, and each of these types is described in the book and shown in drawing and photograph. The victory of the engineers in finally succeeding with the Quebec bridge, after two disasters, is a story of pluck and endurance that every "*M.M.*" reader will enjoy.

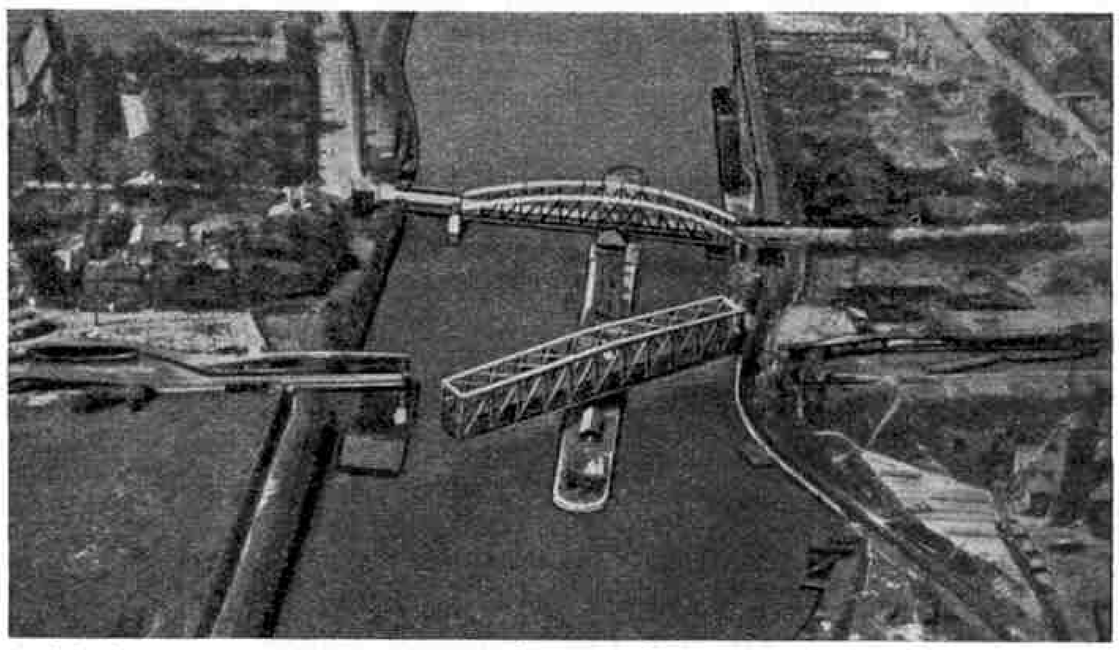
Docks have always a fascination for boys of all ages and the account of London's dock system gives us a sense of pride. The recently completed King George V Dock can deal with three million tons of shipping in a year and in its warehouses are stored the produce of the world. The "hospital treatment" of injured ships is shown in the graving and floating docks, and the story of the first floating dock is well told.

The book goes on to tell how men fight the sea with breakwaters, the importance of which is paramount to a maritime nation like ours. The making of harbours, as at Portland and Dover, gives us another illustration of the wonders of the engineer, all of which are made possible by the use of Portland cement—the invention of a Leeds bricklayer! It will surprise many to read that the Romans built the dome of the Pantheon of concrete—surely there is nothing new under the sun!

We learn that the deserts of the world, by the work of the engineer, have become the prospective gardens of the continents, and the book tells, in picture and story, of the vast achievements in this sphere of work. The harnessing of great waterfalls began with the water wheel, which replaced the revolving mills worked by slaves in Rome and by cattle in Britain. In Western Quebec the Gatineau reservoir will provide sufficient light and power to serve a whole country—it holds enough water to give every person in Canada ten glassfuls every day for three hundred years!



The Gladstone Dock System at Liverpool, showing warehouse with army of cranes and the large entrance lock. This illustration is taken from "Wonders of Engineering" reviewed on this page



Aerial view showing the Barton Aqueduct by which the Bridgewater Canal crosses the Manchester Ship Canal. Beyond the aqueduct, which is shown swinging open, is a swing road bridge. (See above)

Although canals are small and comparatively little used in England, at some places—such as Suez and Panama—they have annihilated distance and established contacts that have resulted in profound changes in the life of the world.

Tunnelling under mountains and rivers has become a specialised and successful branch of engineering, and one that contributes its quota of "wonders." When at last the Channel tunnel is complete, and Britain has ceased in fact to be an island, then the engineers will have forged another link in the chain of engineering wonders that holds the world in its embrace.

This book of wonders is worth getting, worth keeping and worth giving. Happy the "*M.M.*" reader who gets a copy this Christmas!

(Rev. J. H. Martin).

"Living Machinery"

By A. V. Hill
(G. Bell & Sons. 7/6 net)

Although there is no machine as wonderful as the human body, there are not many of us who know anything of its working. Those who want to explore the human machine more fully will find this book a great help. The author describes in simple language the working of those most wonderful parts of the body—the muscles by which we move about, and the nerves by which we arrange when and how we shall move.

The book is based on a series of lectures given last Christmas at the Royal Institution, when Professor Hill brought with him numerous ingenious instruments to investigate and reveal the workings of the human body under the eyes of his audience. With his X-ray apparatus he showed the living heart as a shadow pulsating on a fluorescent screen; he measured the electricity that it generates at each beat, and broadcast the sound of its beating through a loud-speaker.

Many of us who wish we could have attended these lectures and seen all the wonderful experiments, are now able to console ourselves with the next best thing—that is to be able to read of them. In these pages we have a most interesting account of the wonderful human engine, the efficiency of which is compared with that of artificial engines and shown in its larger aspect as a co-ordinated machine.

The book may be recommended to mechanically-minded and machine-loving boys.

"Stars and Atoms"

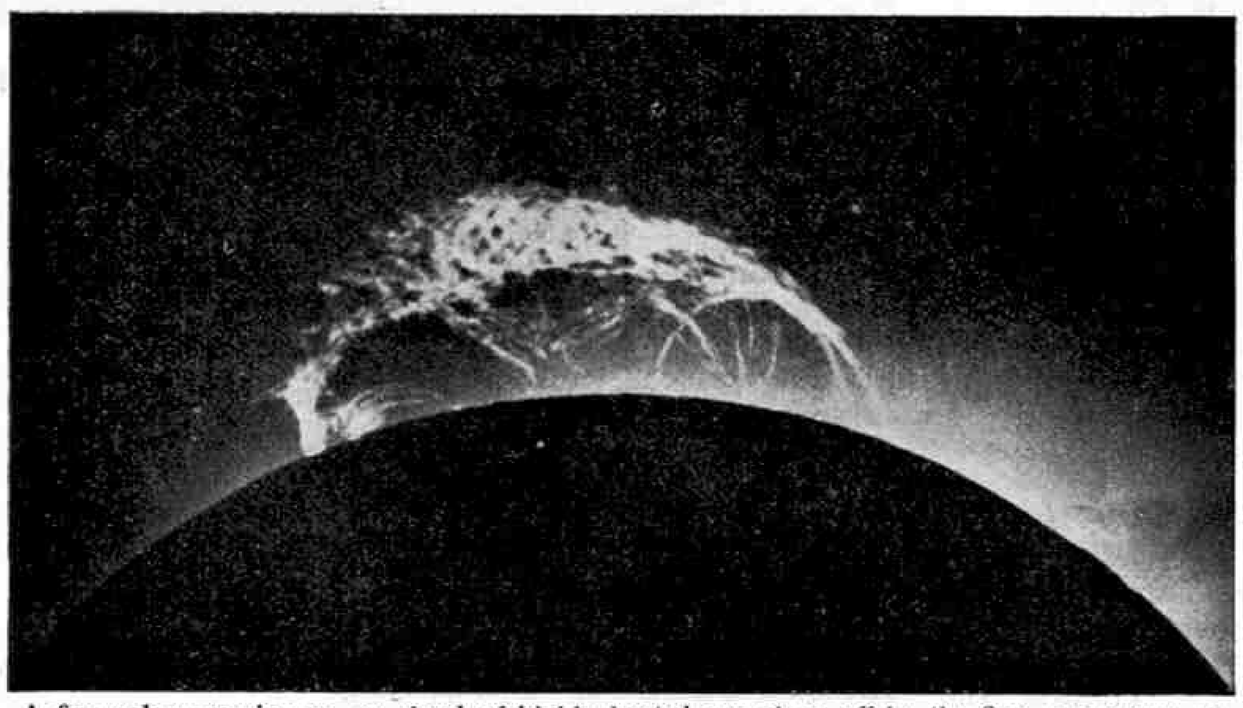
By A. S. Eddington (Oxford. 7/6)

In recent years considerable attention has been given to the study of matter in the extreme conditions prevailing in stars and nebulae, and the discoveries made in this connection have played no little part in the progress of atomic physics. In this book Professor Eddington, of the University of Cambridge, tells us of the great advances that have taken place in our knowledge of atoms and radiation, and describes how these advances have led to many interesting developments in astronomy. The subject is, of course, a vast one, and more particularly so because our thoughts move continually from the exceedingly great to the infinitely small—from the star to the atom, and back to the star.

The book is divided into three parts, the first dealing with the interior of a star, the second with recent investigations, and the third with the age of the stars. There is much that captures our attention and interests us—as, for instance, in the story of Algol, the wonderful variable star, which was known to the Arabs of old as "The Demon's Eye." This, Professor Eddington says "is a detective story, which we might call "The Missing Word and the False Clue," and he proceeds to show how logical deduction solves a scientific riddle.

A variable star is one, the light of which is not constant but fluctuates over different periods. Some of these variable stars seem to be sending light signals to us by a regular series of "dots" and "dashes"—not unlike the intermittent flashes from a lighthouse—which, although they do not conform with the Morse Code, nevertheless do send us a great deal of information. From the signals received from Algol, for instance, we learn that what appears to be a single star is really two stars revolving around each other. Sometimes the brighter of the two stars is hidden, giving an eclipse or a "dash." At other times the faint star is hidden, resulting in a "dot." The fluctuation in the light recurs in regular periods, from which we deduce that the period of revolution of the two stars is 2 days 21 hours. And so Professor Eddington pursues his detective story—showing us how it has been possible to determine not only the period of revolution, but also such particulars as the diameters and masses of the two components, their absolute brightness, the distance between them, and their distance from the sun.

There are other "detective stories" equally interesting throughout the book, which gives us some of the latest discoveries in astronomy in a non-technical language. At the same time Professor Eddington manages to combine a considerable amount of technical information that makes the book of even greater value to more advanced students.



A fine solar prominence, or cloud of highly heated gas given off by the Sun, photographed during the eclipse of 29th May, 1919. The prominence, which is seen behind the dark body of the eclipsing Moon, was about 120,000 miles in height. (See below)

The wonderful star cluster in the constellation of Centauri. Each of these stars is a sun, many being larger than our own Sun, so that these star clusters almost may be regarded as "other universes." This photograph and the one above are taken from "Stars and Atoms" reviewed on this page

"The Fight for the Ashes 1928/9"

By M. A. Noble (Harrap. 15/-)

The keen student of cricket will revel in this critical analysis of the games played during the successful Australian tour of A. P. F. Chapman's M.C.C. team during the 1928/9 season. The author—let us recall for the benefit of our younger readers—is an Australian giant of the past, considered by many competent judges to be the greatest captain cricket has known. He writes with understanding and the authority of experience, and his criticisms of the tactical moves of the Australian and English skippers provide a fund of suggestion for younger players that must prove invaluable in actual play.

Not only the Test Matches, but each game of the tour is followed and its principal incidents are described. We must confess that in our eagerness to get to the Test Matches we felt inclined to skip many of the less important games, but the author's accounts of the minor matches are thoroughly well worth reading.

Mr. Noble's summing up of the test story is warm in its praise of the England XI. "Without doubt," he writes, "viewing the series as a whole, Australia was beaten by a better team. Chapman's men played as a well-balanced combination. They looked like a team. Each man had his place, went there, and did his duty as part of a co-operative unit. The team was well captained. The bowling was cleverly controlled."

His criticism of the Australians is often biting, but nevertheless from Australia's victory in the final test he draws a message of warning to complacent Englishmen. "Thus the series ended with Australia's star in the ascendant . . . . . ", he writes. "It was really a great achievement for Rider's men to rise to the standard they did in the final struggle, especially when we consider the distinct inferiority of the side at the beginning of the season . . . . . The fact that improvement was registered from game to game until triumph was ultimately accomplished demonstrates that the win was not merely a chance win, but was the culminating achievement in an uphill fight that has left the victors for the time being in command of the position. Thus the outlook for 1930 becomes immeasurably brighter from an Australian viewpoint . . . . . The possibility of a battle royal for the Ashes next year seems to be certain."

Not the least important feature of the book is a set of some 50 perfectly-reproduced action photographs showing incidents in the games. These photographs are easily the finest cricket pictures we have seen.

"Sent to Coventry"

By D. J. Dickie

(Messrs. J. M. Dent & Sons. 6/-)

This is a humorous and fantastical book suitable for younger children. Coventry is a real place to which Bill, the young hero of the story, is sent for the usual reason that one is sent there. The extraordinary happenings in Coventry and the droll characters encountered, make this a delightful nonsense book. The illustrations both in colour and in line are beautifully drawn by Christine Chisholm.

* * * *

Warne's "Joy-Fun" series live up to the reputation of their titles: "Joy-Time," "Fun Time," "Merry Time," "Sunny Time." What a bunch of cheerful literature and what jolly little stories they contain! These are designed more for the younger members of the family. The print is large and the quaint little pictures are eminently suitable for the stories they illustrate.

Interesting Books Received

We hope to deal with the undermentioned books in an early issue.

"Great Navigators and Discoverers"
by J. A Brendon.
(G. G. Harrap & Co. Ltd. 7/6 net)

"On the High Seas"
by Keeble Chatterton.
(Philip Allen & Co. Ltd. 10/6)

Puzzle No. 1. *Contributed by J. G. Lowe (Georgemas).*

Can you discover the following objects on a penny when looking at the side bearing the King's head: A well-known animal; a place of worship; a part of a bottle; a part of a hill; a personal pronoun; part of a trunk; part of a whip; a protection against thieves; a river crossing; a badge of royalty and a receptacle for corn?

Puzzle No. 2. *Contributed by C. M. Beattie (Lewes).*

In the accompanying square each letter represents a digit. When these are substituted for the letters, the sum of the numbers in each row, whether horizontal, vertical or diagonal, is 175. In addition the 49 small squares contain the numbers 1 to 49 inclusive, and no number is used twice. What digit does each letter represent?

EG	AF	HC	E	AG	EF	JC
EC	JD	HF	F	AC	HD	D
HK	K	AD	ED	JK	AB	C
AJ	EJ	JB	HB	B	AK	EK
JH	EB	J	AA	EA	JJ	HJ
JA	HA	EH	JE	HE	A	AH
H	AE	HG	JF	HH	EE	JG

The Puzzle of the Digits
(See Puzzle No. 2)

Puzzle No. 3. *Contributed by R. Eastabrook (London, S.E.16).*

A postman was given a letter addressed thus:

Hill,
John,
Hants.

The postman was by no means worried by this strange address and duly delivered the letter. What is the correct address?

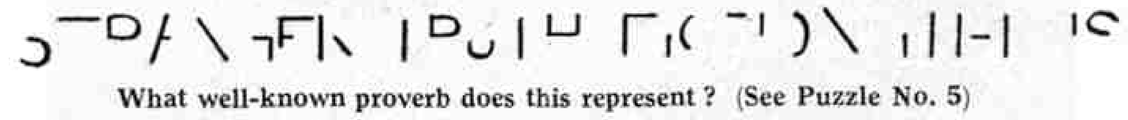
Puzzle No. 4.

The following words are the jumbled names of famous engineers. Who are they?

Stovenest; Ntmseoa; Tteehkrvic; Mmaaadc; Harrigtkw; Walehhes; Rattighcwr; Leysudma; Rudhmoc; Cmnooprt.

Puzzle No. 5. *Contributed by P. Sutcliffe (Rochdale).*

A well-known proverb was set up in type, after which the words were jumbled and the type broken. The result is shown below. Can you identify the original proverb? The letters in each word are in correct order.



What well-known proverb does this represent? (See Puzzle No. 5)

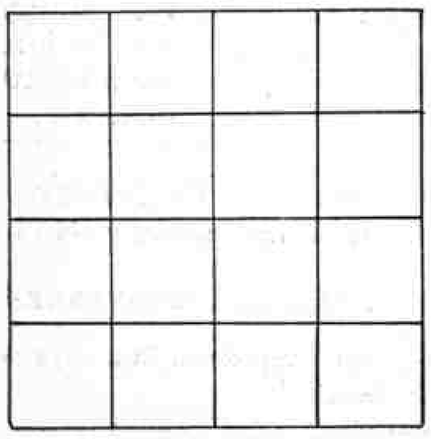
Puzzle No. 6. *Contributed by J. G. Lowe (Georgemas).*

A woman was on her way to market to dispose of her eggs, when she met a neighbour also going to market. "How many eggs have you got to sell to-day?" asked the neighbour.

"Well" she replied, "if I count them in two's, three's, four's, five's or sixes, I always have one remaining over, but if I count them in seven's there are none left over." How many eggs had the woman to sell?

Puzzle No. 7. *Contributed by G. Higgins (Alderley Edge, Cheshire).*

In a certain town the clock on the church tower takes the same time to strike three as the town hall clock takes to strike two. "As I came home," said Jones, "they began to strike at the same instant and the last stroke of the church clock came instantly at the last stroke but two of the town clock." What time was it?



The Consecutive Number Puzzle
(See No. 8)

Puzzle No. 8. *Contributed by F. R. Ripley (St. Helens).*

Fill in the squares shown opposite by putting consecutive numbers in adjacent squares. For example, the number 2 may be placed in a square either above, below or at the side of that containing the number 1, but the numbers in each vertical column must add up to the same total.

Puzzle No. 9. *Contributed by F. O. G. Barrett (Epworth).*

Find the number of four digits in which the first digit is one half of the fourth: the sum of the first, second and fourth is equal to two less than the third; the second and fourth together are three less than the third; the fourth is the square root of the second, and the third is greater than the first by the cube of the fourth.

Puzzle No. 10. *Contributed by G. Higgins (Alderley Edge).*

A train puts down $\frac{1}{3}$ of its passengers at the first station, and takes up 24 new ones. At the second station it puts down half of the people then in the train and takes up 3 others. At the terminus there were 62 passengers. How many were there when the train started?

Puzzle No. 11. *Contributed by W. F. Hayden (London, N.2).*

We are a score, nay, sometimes more,
Within a cave reside,
Though seldom 'tis we disagree,
We often do divide.
If we fall out there is no doubt,
We ne'er shall meet again,
Both boy and girl our worth can tell,
Though oft we cause them pain.
In white array the ladies gay
In mirth will often show us.
From what is said, we are afraid,
You will too quickly know us.

Puzzle No. 12. *Contributed by D. A. Drain (Glasgow).*

Eleven letters I contain,
And if you would find the same,
Know that a figment of the brain,
Will straightway help you to my name.

Clues: The second, third, and fourth letters form a contraction of a girl's name, and the sixth, seventh and eighth a contraction of a boy's name; the second, third and sixth represent a human being; the fourth, fifth and sixth is a snare; the eighth, tenth and eleventh is the name of a weight; the eleventh, tenth and eighth form a word that implies negation, and the fourth, tenth and eighth give the past tense of a verb signifying to acquire.

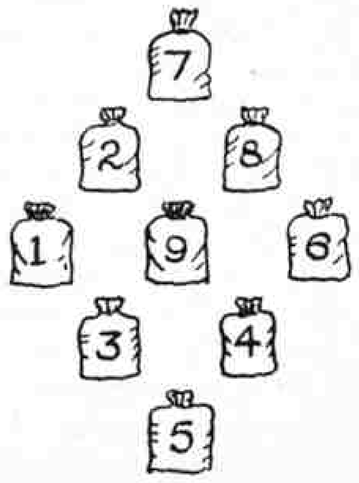
Puzzle No. 13. *Contributed by D. Smith (Derby).*

The six missing words in the following verse all contain the same five letters. What are the words?

Mary sat with . . . . . in hand,
Writing . . . . . dramatic.
Did she . . . . . the plots she planned?
Negative emphatic!
. . . . . to us the . . . . . may be,
But at . . . . . they're new to she!

Puzzle No. 14. *Contributed by K. C. Whittaker (Alderley Edge).*

A miller had nine sacks of flour, each bearing a number. He arranged them as shown in the sketch. The number on the upper pair, 28, when multiplied by the number on the single sack above it, 7, gives the number in the middle, 196. But this is not the case with the product of the numbers on the single sack and the pair at the bottom. It is required to change the positions of the sacks in as few moves as possible in order that the number on each pair, when multiplied by that on its single neighbour, should give the middle number.



The Miller's sacks of flour
(Puzzle No. 14)

Puzzle No. 15. *Contributed by E. Holder (Port of Spain, Trinidad).*

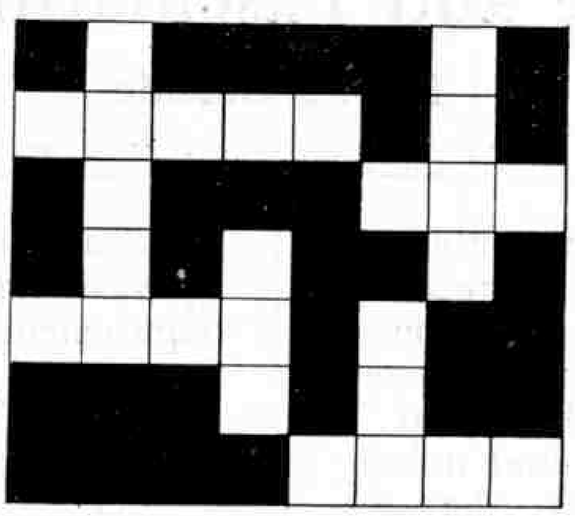
Each word of a well-known proverb is hidden in the following sentence, the words occurring in the correct order. What is the proverb?

He said to her, "Last night I met a band of urchins whose pet idea was to await the arrival of oranges from the Manor, or from a neighbouring village, and steal a few."

Puzzle No. 16. *Contributed by D. Smith (Derby).*

In the opposite crossword, each of the letters of the alphabet is used once and once only. The words may be used either vertically or horizontally but their locations are not given.

Clues: What a squirrel does; a metal; print; a boy's name; look (slang); interrogative personal pronoun; annoy; whim or imagination.



A Crossword Puzzle. (No. 16)

Puzzle No. 17. *Contributed by K. C. Whittaker (Alderley Edge).*

A draper sold ladies' handkerchiefs at 4½d. each or three for a shilling. One day he saw his assistant sell a lady one handkerchief, and asked him why he had not tried to sell the lady three.

"Because," replied the assistant, "you have the same profit on one as on three."

How much did the handkerchiefs cost the draper?

Puzzle No. 18. *Contributed by E. S. E. Gardner (London, N.8).*

From the following clues form a word square, i.e. one in which the same words may be read in a horizontal or vertical direction:—Pain, Biblical character, a female deer, finishes.

Puzzle No. 19.

The names of a number of well-known cars are included in the opposite word square. Starting at a certain square the names may be traced by moving one square at a time to adjacent squares. What are the names?

L	T	E	U	T	R	A	C	I
L	T	N	B	T	S	R	M	L
Y	E	R	E	S	T	S	A	A
O	F	T	U	Z	U	Z	U	S
S	R	S	A	N	T	I	N	O
A	D	R	L	E	B	A	P	Z
L	R	O	E	M	A	I	S	I
O	A	R	L	Y	C	S	H	N
R	R	A	S	R	H	P	A	O

Puzzle No. 19
What well known motor-cars are shown?

Puzzle No. 20. *Contributed by F. O. G. Barrett (Epworth).*

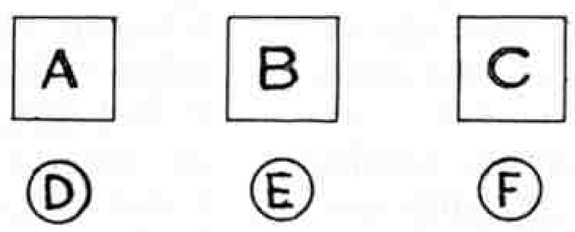
Divide 45 into four parts so that if to the first part you add two, from the second subtract two, multiply the third by two and divide the fourth by two, the sum of the addition, the remainder of the subtraction, the product of the multiplication, and the quotient of the division, are all equal.

Puzzle No. 21. *Contributed by Chand Mal (Delhi, India).*

There are three vessels A, B, and C of capacities 8 pints, 5 pints, and 3 pints respectively. The vessel A is full of oil. How can the oil be divided into two equal portions of 4 pints each with the help of these three vessels?

Puzzle No. 22.

The three houses at A, B, and C in the opposite diagram were each to be served with electric light, gas and water from supply depots at D, E, and F respectively. The owners of the houses stipulated that no wires or pipes should cross each other. How did the contractors carry out their work?



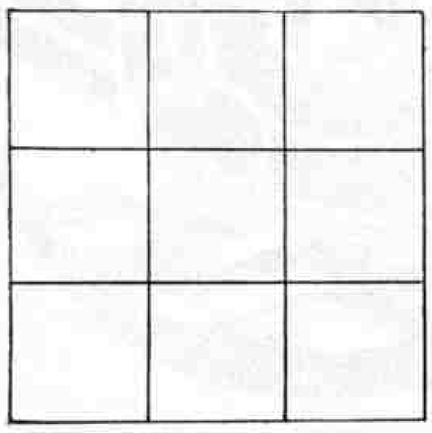
The puzzle of the Three Houses. (No. 22)

Puzzle No. 23. *Contributed by I. P. Simpson (Ulverston).*

A word of three syllables seek till you find
That in it are twenty-six letters combined.

Puzzle No. 24.

Tommy asked his teacher if she knew any English sentence that could be spoken but not written correctly. She had to confess herself beaten, so Tommy told her one. What was it?



Are you good at Arithmetic!
(See Puzzle No. 25)

Puzzle No. 25. *Contributed by S. H. Simons (Barking, Essex).*

What numbers must be placed in the squares of the opposite figure in order that when those in any row are multiplied together the product is 4096? As in the case of Puzzle No. 18 above, the rows may be either horizontal, vertical or diagonal.

Puzzle No. 26.

A draughtsman sitting for an examination found the paper quite easy until he came to one problem, which puzzled him for some time. This was: "How would you fit a round peg into a square hole half an inch in cross section?" Eventually he realised that there was a very easy solution. What is it?

Puzzle No. 27. *Contributed by W. O. Lloyd (Barry).*

My first is in kiwi, but not in wren,
My second is in six, but not in ten,
My third is in prince, but not in duke,
My fourth is in George, but not in Luke.
My fifth is in ship, and also in skip,
My sixth is in chip, and also in clip.
My seventh is in railway, and also in train,
My eighth is in Poland, but not in Spain,
My ninth is in spine, but not in bone,
My tenth is in square, but not in cone,
My whole is a well-known station.

Puzzle No. 28. *Contributed by C. Wilding (Woodbridge).*

A man had a round park in which he told his gardener to plant 24 trees so that there were 24 rows of four trees. After much thought, the gardener was able to carry out his instructions. How did he do it?

Puzzle No. 29. *Contributed by E. F. Hope-Jones (Grayshott, Surrey).*

My first is in rabbit, and also in hare.
My second in orange but not in pear.
My third is in cat, but not in mouse,
My fourth is in kennel, but not in house.
My fifth is in title, and also in name,
My last is in difference, but not in same.
My whole is an engine of which you have heard.

Puzzle No. 30. *Contributed by E. Holder (Trinidad).*

As I am, I'm an animal feared by mankind.
Change but my head, and a fruit you will find.
Now change it again, and ask the reason why,
If you don't chance to see a fissure bye and bye.

Puzzle No. 31. *Contributed by H. Rumbold (Reading).*

What word is that, an adjective,
Its meaning sound and plain,
That though you take the whole away,
Some always will remain?

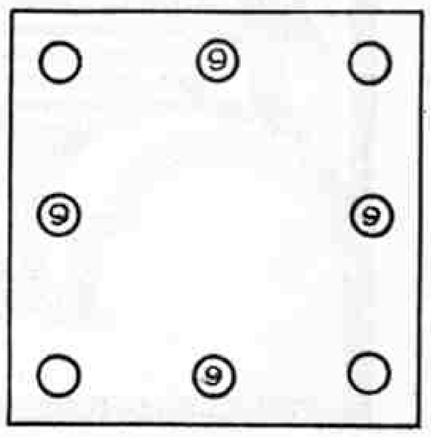
Puzzle No. 32. *Contributed by K. H. Cole (Ampthill, Beds.).*

In the following long division sum the divisor is half the number formed by the first two figures of the dividend, and that made by the next two figures of the dividend is equal to half the divisor. The last figure of the divisor is the same as the second figure of the dividend.

```
XX)6XXX0(X0XX
   6X
   —
   . .1XX
     XXX
     ——
     . . .
     ——
```

Puzzle No. 33. *Contributed by W. Moyce (London, S.E.4).*

Tom's mother had made 36 cakes for her son's birthday party and was suspicious that he would abstract a few! In order to detect any action of this kind she put a plate of nine cakes on each side of a square table, as shown below, and there was an empty plate at each corner. Tom heard his mother explain this plan to his father, and thought out a clever scheme that enabled him to pay four visits to the table, each time taking four cakes without detection, for after each visit nine cakes remained on each side of the table. How was it done?



Tom and the Cakes
(Puzzle No. 33)

Puzzle No. 34. *Contributed by P. Sutcliffe (Rochdale).*

I am a word of eight letters. My first, second and third make a river in England; my fifth, sixth, seventh and eighth a measure of length; my fourth a vowel. My whole is a herb.

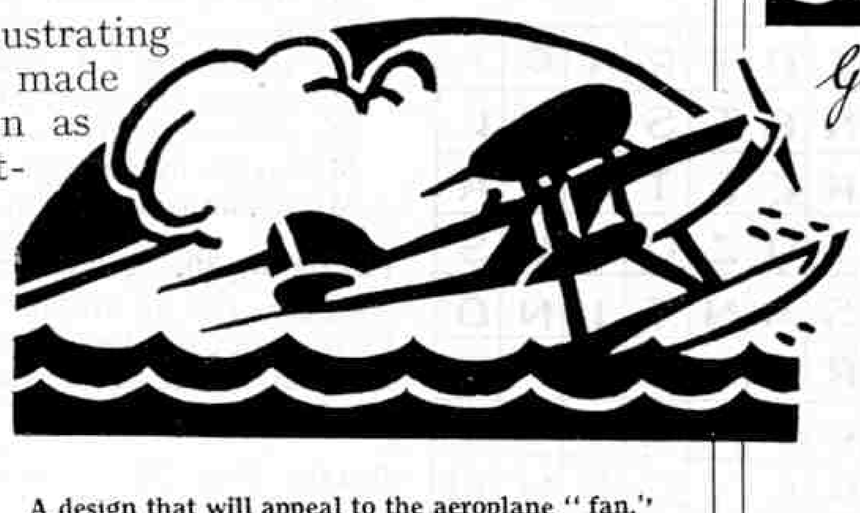
Print Your Own Christmas Cards!

A Simple and Fascinating Hobby

By J. S. Garside

ONE of the most perplexing of the little problems that confront us during the weeks preceding Christmas and the New Year is the selection of suitable greeting cards and calendars to send to our friends. The machine-made products to be found in shops seldom are of really original design, and usually purchasers have to be content with cards that are commonplace in character. This may be avoided by preparing them at home. Making artistic cards and calendars is by no means as difficult a task as may appear, and if the instructions given in this article are followed, it will be found to be a simple but fascinating hobby.

The examples illustrating this article have been made by the process known as "linoleum block printing." In this a suitable design is transferred to the surface of a sheet of linoleum, and portions of the surface of this are then cut away in such a manner that the design stands out in relief. The product is an effective printing block, and when coated with ink by means of a roller and pressed into contact with a sheet of paper or thin card this gives a very satisfactory impression or "print" of the original design.



A design that will appeal to the aeroplane "fan." It makes a particularly pleasing calendar

The tools and materials needed for work of this kind are very simple and by no means costly. The most important is the linoleum of which the printing block is made. This should be of good quality and about $\frac{1}{4}$" in thickness. Suitable pieces may be obtained from any linoleum warehouse or furniture store. It is not necessary to purchase a large sheet, for the blocks to be made are small and scrap pieces of suitable size may be obtained for a few pence.

A simple Christmas card design. Greetings may be written in the enclosed white space

The principal tools required are a penknife with a finely pointed blade and a small U-gouge about $\frac{3}{16}$ in. in width. The latter costs about 2/–, and for the penknife a special linoleum cutting knife costing 1/– may be substituted. Alternatively a set of five "pen-steel" cutting tools complete with a holder may be obtained for 1/3.

For printing purposes a rubber-covered roller 4 in. in width will be required. This may be bought for 1/6, or an old photographic squeegee roller may be pressed into service. Additional requirements include a tube of black or coloured printing ink, Indian ink, carbon paper, and a small paint brush. With the exception of the linoleum, all the materials necessary may be obtained from any art store; most local printers will be able to supply a small quantity of black or coloured ink of suitable quality.

In order to show clearly how the tools and other materials are used, the actual preparation of a block may be described. For a first attempt one of the designs shown in the illustrations to this article should be used, for experience has shown that they are of a very suitable character for the novice in this hobby.

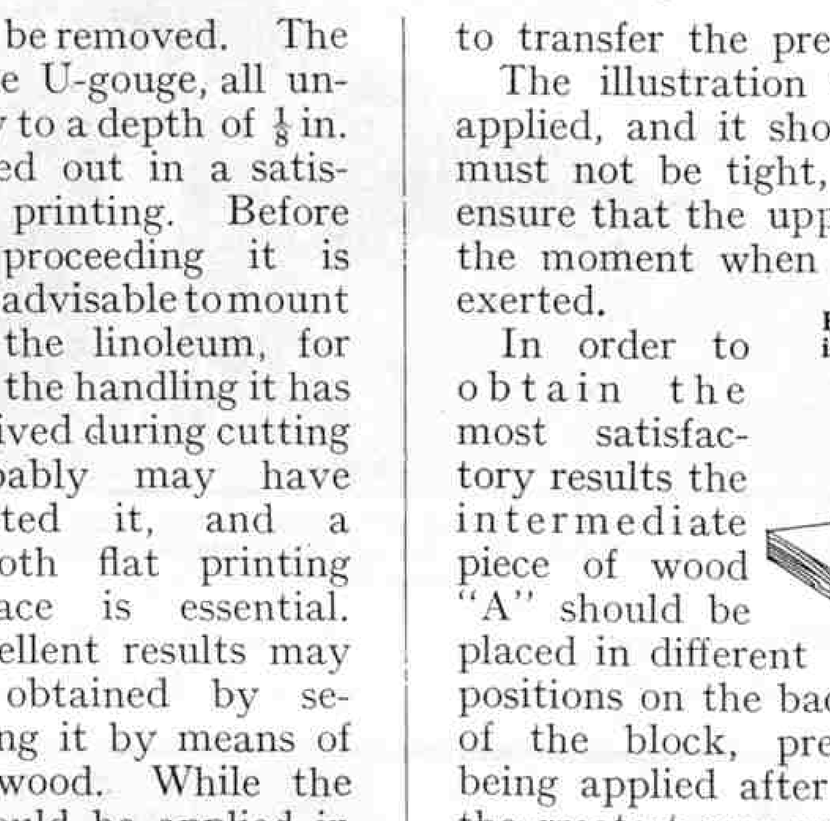
The first step in making a block is to draw the chosen design on a sheet of plain paper, making the drawing the exact size required. It is then transferred to a sheet of linoleum that is sufficiently large to leave on it a margin of about $\frac{1}{2}$ in. in width. In order to transfer the design, the paper on which it is drawn is laid on the linoleum, a sheet of carbon paper being interposed between the two. With a sharp-pointed pencil the entire design is then traced out, and on taking up the paper it will be found marked on the linoleum.

The replica of the original design thus obtained is not sufficiently prominent, and if it is not strengthened in some manner will be rubbed off during cutting. In order to avoid this the entire design is "painted in" in Indian ink applied by means of the small brush mentioned in the list of tools, and this must be allowed to dry before proceeding further.

This picture of a galleon is a half-size reproducton of a design suitable for a calendar

Next follows the cutting operation. This is begun by cutting a V-shaped trench along the lines of the pattern. For this purpose two parallel cuts are made, one on the outside edge of the line and the other in the clear space about $\frac{1}{16}$ in. from the first. The cuts should be about $\frac{1}{8}$ in. in depth, and in making them the knife must be held at a slight angle, in the one case pointing away from the line and in the other towards it. The two cuts combine to form the V-shaped incision required, and the linoleum enclosed between them is then prised up with the point of the knife. A glance at Fig. 1 will help to make the whole process quite clear.

By cutting shallow trenches along the edges of each line, the design is completely separated from the rest of the block. The surface of the linoleum in the position that the background will occupy is still of the same height as the design itself, however, and before printing this must be removed. The operation is carried out by means of the U-gouge, all unwanted surface being carefully cut away to a depth of $\frac{1}{8}$ in.



An effective drawing of an early steam-boat forms the subject of this novel Christmas card design

When this process has been carried out in a satisfactory manner the block is ready for printing. Before proceeding it is advisable to mount the linoleum, for the handling it has received during cutting probably may have twisted it, and a smooth flat printing surface is essential. Excellent results may be obtained by securing it by means of Seccotine to a sheet of three-ply wood. While the Seccotine is drying even pressure should be applied in order to ensure good contact.

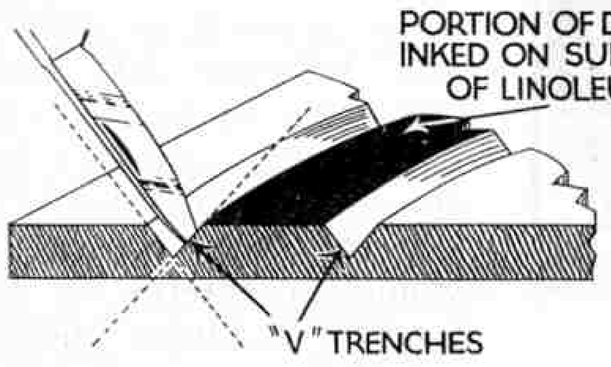


Fig. 1. Section through block of linoleum showing the method of using the knife to cut the "V" trenches

All is now ready for the actual printing, and the first step is to coat the raised portion of the surface of the block with ink. A small quantity of the thick liquid is placed on a sheet of glass about 6 in. square, and over this the roller is run backward and forward under pressure until the ink has been spread evenly on glass and roller. Success in printing depends very largely upon carrying out this process thoroughly, and especial care must be taken not to use too much ink. The noise heard during rolling will guide the amateur printer. If the ink "smacks" loudly, too much is being used and steps should be taken to reduce the amount until a less noisy effect is obtained.

When the ink has been evenly distributed over the surface of the roller the latter is passed several times over the linoleum block in order to give it an even coating. This must now be transferred to the paper or card on which it is to be reproduced. In order to do this the block must be firmly pressed on the paper. Pressure may most easily be applied by means of a letter copying press, but equally satisfactory results follow the use of the home-made press illustrated in Fig. 2. In order to construct the press two wood boards are required. As shown in the sketch these should be linked together at one end by means of a length of heavy cord or rope. The paper or card that is to receive the impression of the block is placed on the lower board, and on it the inked block is laid face downward. A third piece of wood is then pushed in between the back of the block and the upper board. This is marked "A" in Fig. 2, and its purpose is to transfer the pressure to the block.

The illustration clearly shows how the pressure is applied, and it should be noted that the rope or cord must not be tight, but should be sufficiently slack to ensure that the upper board is practically horizontal at the moment when the greatest pressure is being exerted.

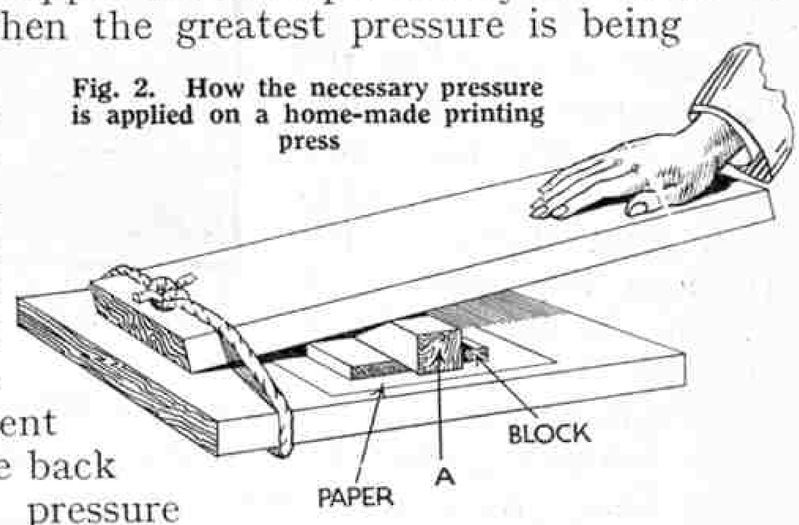
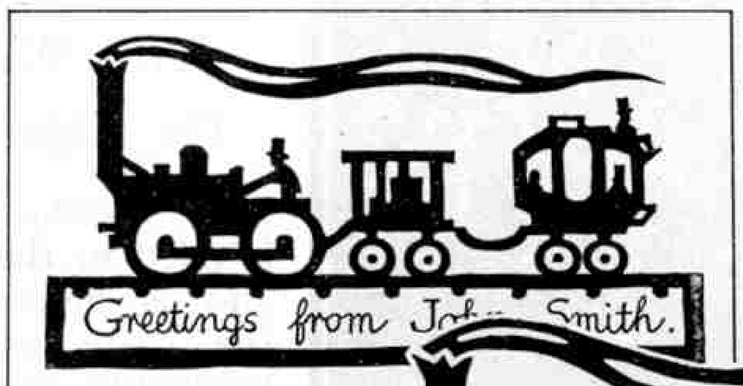


Fig. 2. How the necessary pressure is applied on a home-made printing press

In order to obtain the most satisfactory results the intermediate piece of wood "A" should be placed in different positions on the back of the block, pressure being applied after each move. During this operation the greatest care must be taken not to disturb the block itself, for otherwise the impression will be ruined.

A little practice may be needed before satisfactory prints are obtained, but the art of applying an even pressure over the entire printing surface is quickly acquired, and then it is a simple matter to take a large number of excellent impressions.

A point that always must be kept in mind is that, in printing, the design on the block is reversed from left to right. Certain designs are not affected by the change, but in others reversal gives results that are fantastic. In order to reproduce exactly the original design, therefore, this must be reversed before transferring it to the surface of the linoleum. For this reason it is best to copy it on a sheet of tracing paper, which may be turned over before laying it on the linoleum.



A design that will delight all railway enthusiasts! The space below the rails is intended for ordinary writing, as indicated in the above illustration of an actual card

Readers of the "*M.M.*" who embark on this new and useful hobby will have little difficulty in finding suitable drawings for reproduction, or in composing entirely original designs. The illustrations to this article have the appearance of woodcuts, and generally

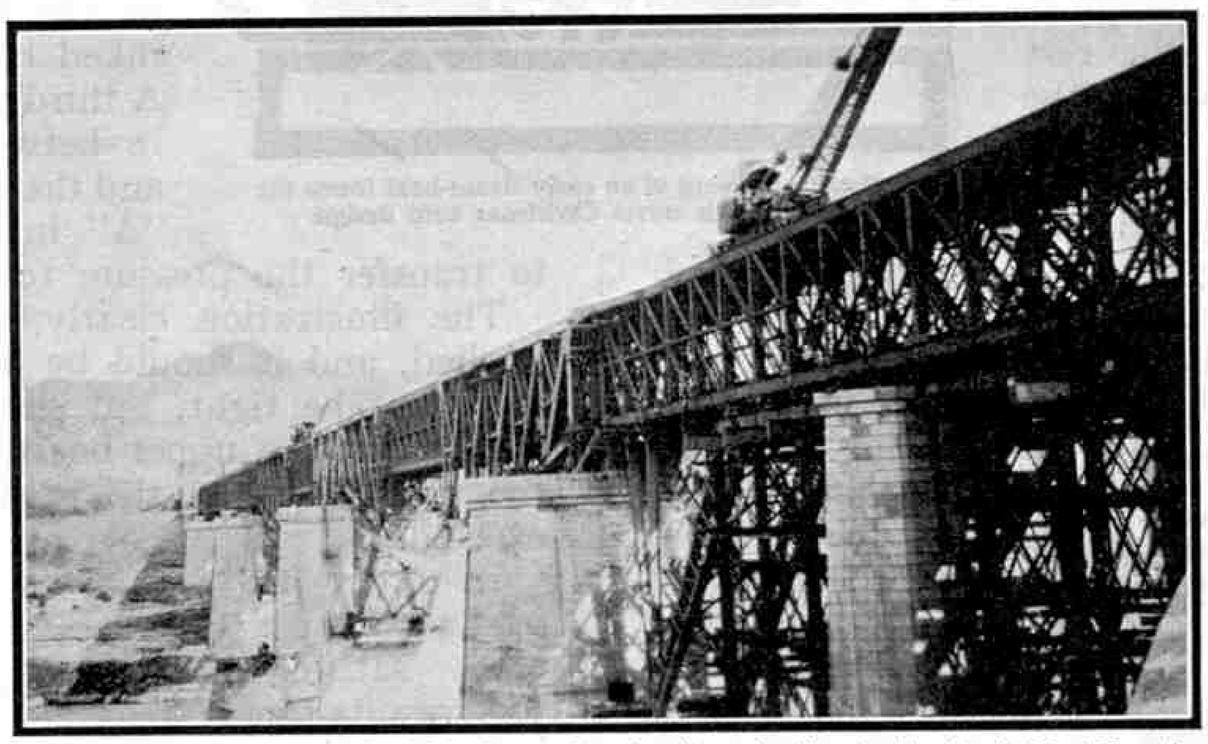
(*Continued on page 960*)

FROM OUR READERS

These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side o the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for these pages are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

Rebuilding an Indian Bridge

A remarkable engineering feat brought to a successful conclusion during 1929 was the reconstruction of Attock Bridge. This is in the foothill country between Rawal Pindi and Peshawar, and strategically is the most important in India, for it carries across the Indus the road and railway leading to the Khyber Pass. The existing bridge was 50 years old, but although it was still sound, it was incapable of carrying the locomotives with axle loads of 22½ tons now employed, and in addition road traffic, which runs on the lower deck of the bridge, had increased to an extent that was beyond the capacity of the structure.



Attock Bridge, by means of which the road and railway leading to the North West Frontier of India is carried across the Indus. This was constructed around the existing bridge without disturbance of traffic

In rebuilding the bridge the engineers responsible were faced with the difficulty of throwing across the river gorge two entirely new spans, each 308 ft. in length. These were to enclose the old bridge and were to be constructed without interruption to the streams of traffic. In addition, land approaches had to be strengthened and new piers built to support the greater weight of the new structure.

The work proceeded safely and steadily in accordance with plans, and finally came to the interesting and crucial moment when the two arms of the second of the main spans were to be united. One of the 25-ton cranes lowered into position the final member, which was securely riveted to one half of the span. The position of the other half was then altered by means of large wedges and screw gear installed inside the main pier until the riveted holes of the two sections were exactly in alignment. The entire span was then lowered 2½ in. in order to bring it to rest in its final position on the piers. The final adjustment was made very carefully, and in order to lower the span by this small amount it was necessary to make no fewer than 4,000 revolutions of the screw gear used. It is believed that the task of building a new bridge around an old one without impeding traffic for a single moment has never before been accomplished.

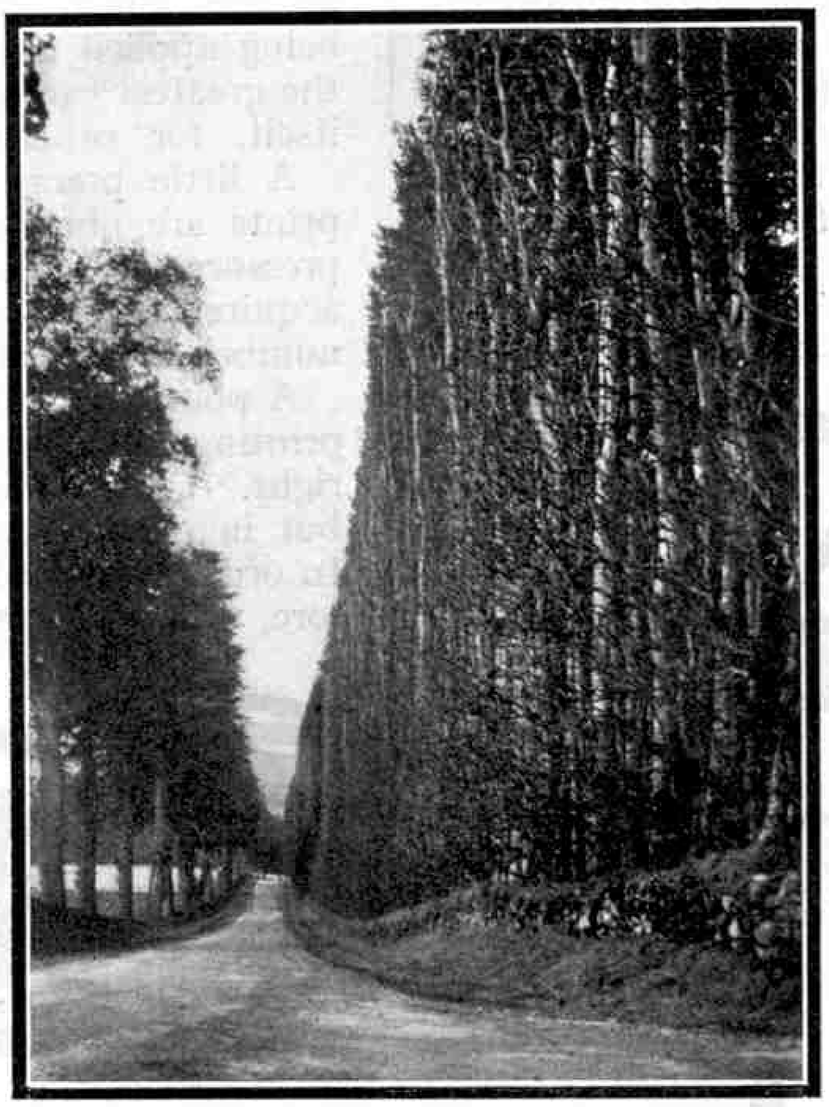
D. G. GRUGEON (Epsom).

World's Largest Hedge

The accompanying photograph shows a wonderful hedge of beech trees at Meiklour, a little Perthshire village situated on the main road from Perth to Blairgowrie. The hedge is 100 ft. in height, and between 500 and 600 yards in length. It has strong claims to be considered the world's largest hedge, and it would be interesting to learn if a larger one is known to any readers of the *"M.M."*

The photograph was taken during the trimming operations that are carried out every few years, and the uncut portion may be clearly distinguished. Trimming a hedge of this size is by no means an easy task and, as may be imagined, the work is decidedly risky.

R. C. DUFFUS (Birmingham).



Is this the world's largest hedge ? It may be seen at Meiklour, Perthshire, on the road from Perth to Blairgowrie

Fire Walkers in India

The Hindoo festival known as *"Holi"* is celebrated on the 24th March. On that day wood is piled in the centre of the street, and is lighted by a member of the caste of *"Bhangi,"* or untouchable persons. Into the fire the Hindoos then throw coconuts, flowers, and other things, and as the wood burns away the live coals from the fire are spread in the street, and the people walk barefooted over them.

When I first heard of this I did not believe it, but since then I have not only seen the astonishing feat performed, but actually have walked over a layer of live coals one foot in depth. I was very reluctant to join those who ventured on the fire, but to my amazement I found that I also

could walk over it without receiving injury. The only effect that I experienced was when I placed my foot on burnt coconut shell; then I perspired from head to foot.

It is said that only Hindoos can walk on the fires that are spread in the street on the occasion of this festival. I can give no explanation of the astonishing fact that nobody is burned. M. C. PATEL (Baroda).

To the West Indies by Tramp Steamer

During last summer I was delighted to have the opportunity of making a voyage to the West Indies on a tramp steamer. The sea voyage really commenced when the pilot departed in his motor launch, and the Captain invited me to join him on the bridge. The weather was very bad and Start Point, the last bit of England visible, was almost obscured by mist and rain. Almost immediately we were given a thrill, for a wireless message reported that a drifting mine had been sighted 3½ miles s.w. of Start Point. We had no wish to be blown skyward and an extra lookout man was posted in the bows.

Next day I almost wished I was back at school, for we entered the Bay of Biscay and encountered rough seas! The feeling soon passed and a day or two later I had learnt to keep my balance when walking on the rolling decks. This was fortunate, for it enabled me to take part in a diverting incident. The ship's pig broke out of its sty and commenced a leisurely stroll on the after deck amid the chickens, turkeys and sheep that were to be killed and eaten after our supplies of frozen meat had been exhausted. The porker was not driven back without difficulty, and in the scuffle succeeded in nipping the ankle of one of the seamen.

After spending a week at sea I rose early one morning to join the Chief Officer on his watch, which extended from 4 a.m. till 8 a.m. My purpose in doing so was to obtain the first glimpse of the lighthouse on Retorta Pont, a Cape on the south eastern end of San Miguel, the largest of the Azores. At 5.25 we sighted the light, which was about 30 miles away and slightly on the port bow. A thick mist then surrounded the vessel and speed was reduced until it cleared, when the island itself became visible as a blue haze on the horizon.

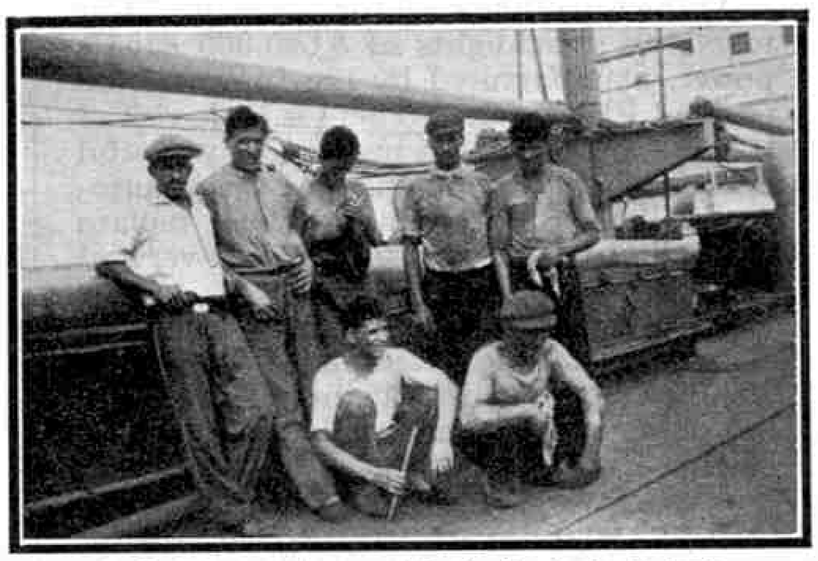
After leaving the Azores behind us the weather became so warm that I slept in a hammock slung on the lower bridge, an occasional song from the Arab stokers and the steady tread of the officer on watch on the bridge above being the only sounds that disturbed me. On several occasions during this portion of the voyage I took the wheel for short spells, and was surprised to find that steering is quite a nerve racking task, for every big wave joins with the current and the wind in taking a vessel off its course. Fortunately very little physical power is needed on large modern ships, in which all the heavy work involved in steering is done by means of steam.

Three weeks after leaving England we sighted first the Virgin Isles, then Porto Rico, and finally Haiti, our destination. After steaming along the coast for some days, we reached a village called Barahona, which was our first port of call. There we picked up the pilot and his interpreter, both coloured men, and the vessel was brought up to the pier, thus coming to a standstill for the first time in three weeks after a voyage of more than 4,000 miles.

A. E. CLARK (Bromley).

Fossilised skeleton of Ichthyosaurus, a giant marine reptile of millions of years ago. The fossil was discovered in a limestone quarry at Harbury, Warwickshire. This photograph is published by courtesy of N. M. Richards & Co.

Our reader at the wheel of the vessel in which he made a voyage to the West Indies



Arab stokers enjoy a rest in the fresh air on deck

Discovery of a Gigantic Fossil

One gloomy morning three workmen in the limestone quarries at Harbury succeeded, after much patient endeavour, in removing a huge slab of rock, and were astonished to find beneath it the tip of the tail of the fossilised skeleton of a prehistoric animal.

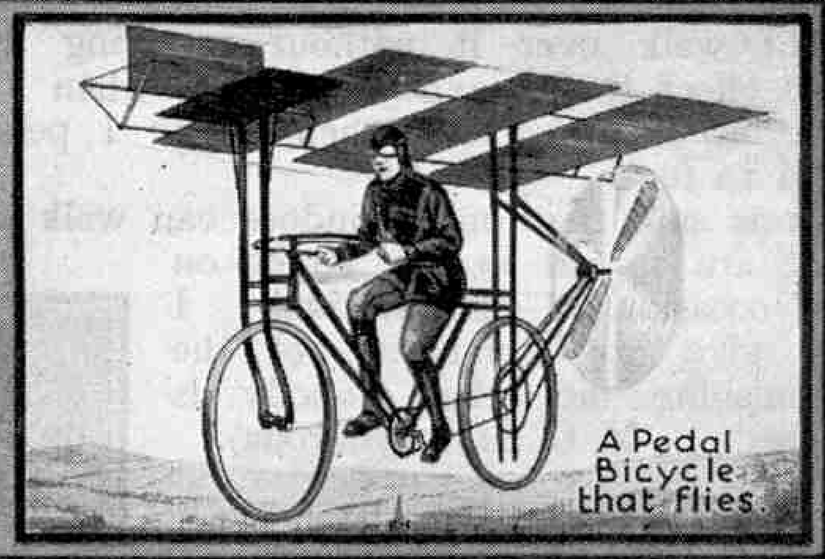
I arrived on the scene about two o'clock in the afternoon and was just in time to see the removal of the last piece of stone that covered the head of the fossil. When the entire skeleton could be seen we were amazed by its size. From head to tail it measures 29 ft. 6 in.! The gigantic head is triangular in shape and ends in a long snout. No traces of a neck are visible, the head being joined directly to the body.

The longest portion of the fossil is the tail. When the discovery was made this was thought to be 15 ft. in length, but later a detached portion 5 ft. in length was found, and thus when alive the creature must have been nearly 35 ft. in length!

A geological expert informed us that the fossil is that of one of the largest specimens of *Ichthyosaurus Platydon* ever discovered. The creature with this formidable name flourished in large numbers millions of years ago, when it was one of the terrors of the sea, for it was a fierce reptile that preyed on other inhabitants of the ocean. The finding of such a fossil at Harbury is a proof that at one time during the Age of Reptiles this part of England was covered by a deep sea.

E. V. MORGAN (Warwick).

OUR BUSY INVENTORS



Piano Played by Light Rays

A Vienese engineer has invented a musical instrument that he calls a "super-piano." It has a keyboard similar to that of an ordinary piano, but that is the end of the resemblance, for it has no strings or hammers and it is controlled electrically. The inventor has already given a concert from the Vienna radio station in which he demonstrated the capabilities of his instrument.

The "super-piano" is actuated by rays of light directed by the movements of the keys on to a number of selenium resistances in high frequency circuits, the currents through which are amplified by means of valves. A foot-pedal is used to regulate the amplifier in order to vary the notes produced in the loud speaker from the softest pianissimo to a fortissimo exceeding that of a very powerful organ.

The only instrument of this type yet constructed has a single keyboard, but the inventor says that it is quite an easy matter to construct others with multiple keyboards. Each of these keyboards would control a definite tone; thus one would give effects similar to those of a piano, while others would give the characteristic tones of stringed instruments, or of brass. In fact, a complex "super-piano" played by several men might be used to replace an entire orchestra.

Big Claims for Fireproofing Process

It is reported that a Liverpool chemist has invented a material that, when applied to their surfaces, makes wood, cotton and other inflammable materials fireproof. The inventor claims that, when a piece of canvas that has been treated with his secret material is soaked in petrol and set ablaze, it remains unharmed after the flames have died away and is scarcely warm in spite of the heat to which it has been subjected!

The chemist was led to experiment on the production of a fireproof paint or dope in the endeavour to find some means of preventing the fires that often occur when aircraft meet with disaster. His "dope" is said to be acid-proof, capable of resisting fire from bombs and shell explosions, and of exterminating white ants.

According to the inventor the chief weapon in future wars will be liquid fire, and he proposes to use his invention in the production of suits and helmets to resist its attack. It is interesting to note that similar claims are made for a chemical produced by two Los Angeles scientists.

Chicago's First Aerial Lighthouse

The first beacon combining revolving searchlights and neon tubes has been installed on the Roanoke Tower, one of Chicago's skyscrapers. The searchlights are mounted on a 54-ft. hexagonal steel tower erected on top of the building, and the height of the beacon above the ground is 520 ft. It is expected that on clear nights its light will be visible at a distance of 100 miles.

Courtesy [*International General Electric Co.*

On clear nights the beams of the two searchlights of this aerial beacon, which has been erected on a Chicago skyscraper, are visible at a distance of 100 miles

At the top of the steel tower are two 24-in. revolving searchlights of 8,000,000 candle power, manufactured by the International General Electric Co. There is little risk of a breakdown of these immensely powerful lights, for they are equipped with automatic devices that immediately replace lamps that fail. Below them are 24 vertical neon tubes fixed to the uprights of the tower supporting the searchlight, and they are flashed in code letters in order to guide aviators. At night their pink glow makes the beacon a wonderfully picturesque object.

The light, which is known as the Chicago Central Aerial Beacon, has been officially recognised and is operated nightly from dusk to dawn. Later one of the searchlights will be directed on the landing field that it is proposed to make in Grant Park, Chicago, and thus the beacon will not only act as a lighthouse of the skies, but also will directly point the way to the landing place.

Voting by Machinery

A machine that makes voting a simple and rapid operation has been demonstrated in New York. Its inventor reports that the complete machine can be set up in 15 minutes, and all that is then required to set it in motion is to push a plug into a wall socket.

The voter merely turns a handle at the side of one of the names on the list exhibited beside the machine in order to indicate that he wishes to vote in favour of that particular candidate. The lists that must be studied by American voters are long and complicated, but even then the entire operation occupies only from eight to ten seconds. In elections in which only one or two votes at a time are cast the time will of course be much less.

Combined Sun-Dial and Calendar

A St. Louis inventor has produced a sun-dial that not only gives the time but also the date. In making the instrument the north and south line is found in the usual manner, and the triangular upright that casts the shadow is fixed into such a position that the shadow at mid-day is along the meridian. To complete the sun-dial a semi-circle is then marked on the base and the position of the shadow at different hours marked along the arc. The sun is highest in the sky at mid-summer and lowest at mid-winter; so that the shadow cast at mid-summer is shorter than that at mid-winter, while at intermediate times its length is somewhere between the two. By careful observation the inventor was able to make marks that enabled him to determine by the length of the shadow the time of the year when it was cast.

The dial of the sun calendar as finally constructed has the usual circle on which the hours are marked, but this is crossed by lines that show the position of the end of the shadow on various days of the year. In a sun-dial of ordinary size there is not sufficient room to mark every day, and the inventor has been satisfied with marking weekly positions. The lines have been drawn right across the dial in order to enable the date to be determined at any hour of the day, as well as the hour to be found on any day of the year.

Depth Sounding in the Air

It is very important that the pilot of an aeroplane should be able to tell exactly how far above ground he is flying. On some machines in America he now learns this by looking at signal lights that resemble those in use in the robots that control the traffic at busy street crossings. In front of him is an instrument in which the appearance of a green light tells him that he is 250 ft. or more above ground, while a yellow light shows when his height becomes less than this figure. If by any chance he approaches within 50 ft. of the ground a red light appears, thus warning him that he must gain altitude, unless, of course, he is landing.

This instrument is the invention of Dr. Alexanderson, the engineer of the International General Electric Co., who is already famous as the inventor of a system of television. It works on exactly the same principle as the sonic depth sounder used for determining depths at sea. The last-named instrument measures the time taken by sound waves to travel from a ship to the ocean floor and back again; the airman's altimeter works by timing the return of wireless waves from the surface of the earth. The construction of a wireless altimeter is much more difficult than that of a sonic depth sounder for use at sea, for wireless waves travel at 186,000 miles per second; whereas sound waves in water travel only at a speed of 4,699 ft. per second.

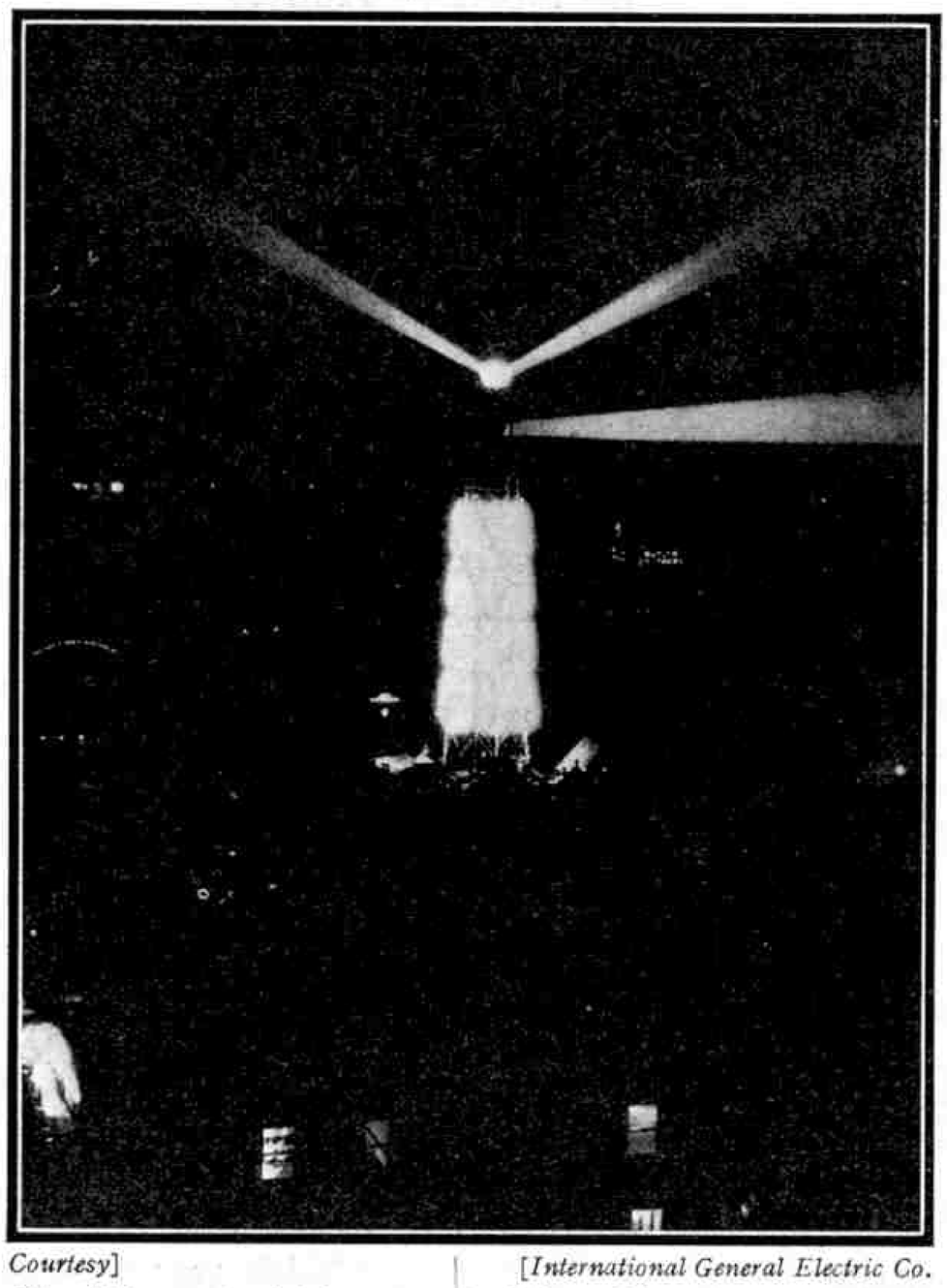
Dr. Alexanderson's instrument not only exhibits coloured signal lights, but also shows on a dial the actual ground distance. It acts automatically, the echo being received and the height recorded at frequent intervals. It may happen that the pilot's attention is distracted at the moment when the indication appears on the dials, and in order to enable him to know how far above ground he is under these circumstances a "memory meter" is incorporated. In this the height registered at one sounding is shown on the dial until a stronger echo returns from earth. This is a safeguard against loss of height, for if a machine is climbing the successive echoes become weaker. It is only when an aeroplane approaches the ground that the echoes become stronger, in which case the memory meter will give warning by registering a new figure on the dial.

The memory meter may be switched out of operation when not wanted, thus leaving the pilot to rely on continuous observation, and enabling him to take depth soundings at any time, whether his 'plane is ascending or descending.

How Inventions are Made

An interesting illustration of the casual manner in which many inventions have originated has recently been given in California. A Dutch farmer who lives in that state happened to observe a ranch-hand trying to close a barn door in the teeth of a strong wind, and it occurred to him that the power against which the man was struggling should be put to practical use.

As a result of this chance observation the inventor mounted four wooden paddles on a horizontal shaft, and erected a screen to cover the lower half of the revolving mill in order that the wind could only act on one side of each paddle. The mill was placed in a position in which full advantage could be taken of the prevailing winds, and it worked in such a satisfactory manner that the inventor erected three similar mills alongside. The shaft, which is common to all four mills, is geared to pumps and dynamos, and the plant is capable of developing 50 h.p.

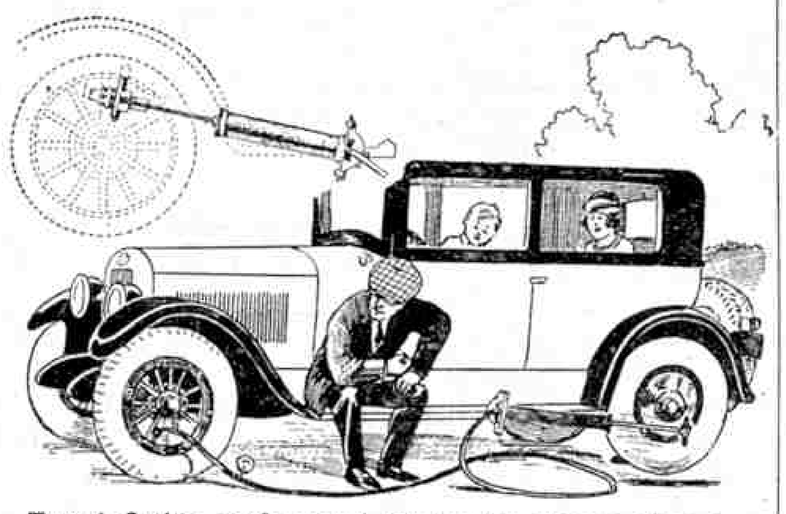


Courtesy] [*International General Electric Co.*

The Chicago aerial beacon at night. The glow round the tower is caused by 24 vertical neon tubes. (Compare with the illustration on previous page)

Clamps for Tyre Pump

A patent has been granted in the United States for a set of clamps to permit the familiar hand pump to be driven by the



Tyre inflation made easy! The pump shown above is operated from the jacked-up rear wheel

motor car engine. One end of the pump is secured on a swivel to the running board of the car; the handle is then fastened by another swivel clamp to one of the rear wheels, which is jacked up and turned by putting the gears in engagement and running the engine.

We imagine that in England, at any rate, the hand pump, or the garage portable electric pump, will continue to remain popular and the new invention will remain an interesting novelty only.

Spring Gates for Railway Crossings

A newly-invented gate for level crossings on railways prevents damage being done when a motor car or other vehicle crashes into it. The gate resembles a violin bow in that it is made in two parts, the hair being represented by two steel cables. These cables are really springs that give on impact, and any car that dashes into them is quickly and harmlessly brought to rest. The gates are designed to open easily from the track side, and thus any vehicle that accidentally may be caught within the gates on the approach of a train may be removed to a safer place without difficulty.

Machine to Plant Telegraph Poles

In many countries difficulty is experienced in planting telegraph poles on account of the rough and hilly nature of the ground. The difficulty becomes greater when the work must be carried on at a distance from a highway, and a machine that has been invented for the purpose should prove very useful.

The machine is mounted on a Fordson tractor with a caterpillar track, and is thus capable of negotiating any sort of ground. It is equipped with power-driven augers that bore holes of any diameter from 8 in. to 24 in. A derrick that may be brought into operation by the driver is used to hoist the telegraph pole, and one or two men then find it easy to guide its lower end into the hole already bored. The derrick is capable of dealing with poles up to 45 ft. in length. Besides boring the vertical holes in which the poles are planted the machine is capable of drilling holes at any angle in order to make secure anchorages possible.

Rotating All-Electric House

A very unusual and attractive house that has been invented by an American was recently exhibited in New York. The entire building is mounted on a central vertical shaft in order that it may be rotated, and it is so well balanced that, although it is two storeys in height and weighs 1½ tons, it may be turned quite easily by a ¼ h.p. motor.

The chief purpose of the invention is to enable residents in the house to turn it round in order that one room may face the sun throughout the whole day; but the building is also interesting as an excellent example of an all-electric house. The chief room contains electric floor lights, two electric torches, an electric clock, and a wireless set worked from the mains. Electric heating is used, but the fireplace has the appearance of an ordinary fire and contains specially designed imitation fuel. The dining room and kitchen are also fully equipped electrically, the latter having an electric dish-washer, refrigerator, and ventilator fan. Even the sewing machine is electrically driven, and one of the bedrooms is fitted with a sun ray apparatus.

* * * *

The labour-saving devices for the home on view at the recent Exhibition of the Institute of Patentees included one by means of which a fire previously laid in a downstairs room may be ignited by pulling a cord in a bedroom.

Puzzle Your Sharp-Eyed Friends

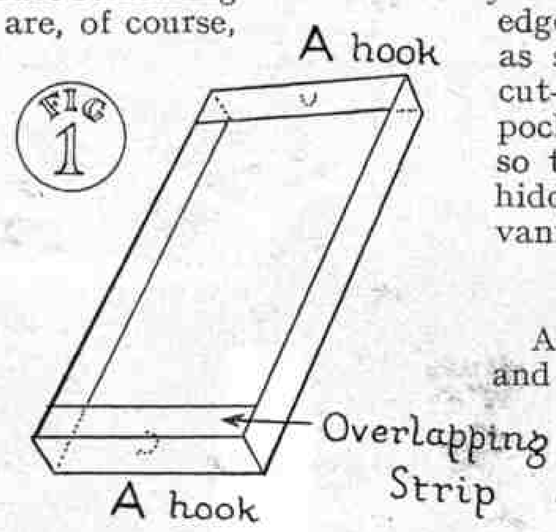
Home-Made Magic for Christmas

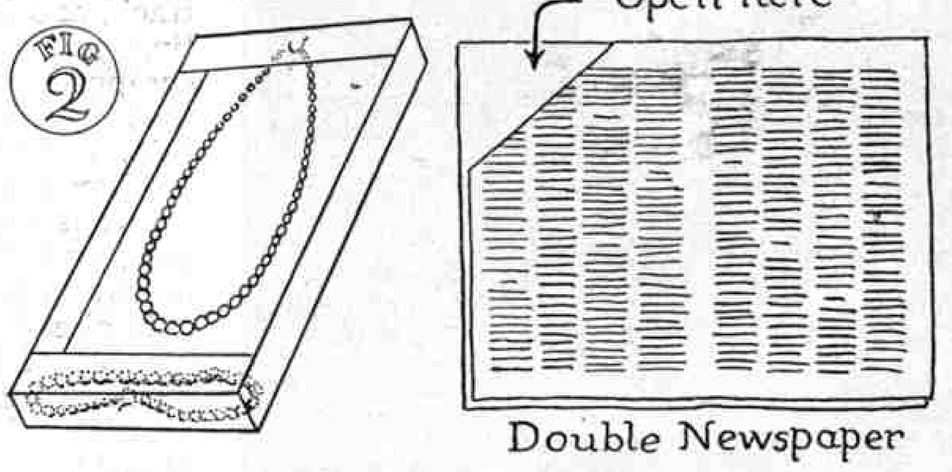
By Norman Hunter

AT Christmas, more than at any other time of the year, occasions arise when each one of us is expected to contribute something towards an evening's entertainment. There are, of course, many ways in which this may be done, but one of the most effective consists in performing a few simple conjuring tricks. The tricks I described in the "*M.M.*" for last December proved so popular that the Editor asked me to describe a further series, and here they are.

Before proceeding to describe the actual tricks, I wish to impress upon my readers the absolute necessity of practising each trick repeatedly, in private, before performing it before an audience. A further point is that, if at all possible, the same trick should not be repeated before the same audience. In order to distract the attention of the audience at critical moments in the performance of a trick a few jokes and witty sayings should be selected and memorised. Even when the greatest care is taken it is always possible for some little thing to go wrong during a trick, and if the conjurer can keep on talking there is a much better chance of remedying the mistake without the audience noticing that anything has occurred.

Now we come to our first trick, which is called :





The secret of the "Homing Necklace" revealed ! The necklace disappears in the secret pocket shown in Fig. 4, and an exactly similar one from the hiding place shown in Fig. 2 takes its place

THE HOMING NECKLACE

A pearl necklace is seen resting in a box on the conjurer's table. He takes it out and closes the box. He then makes a cone or sugar bag from a piece of newspaper and drops the necklace inside.

"This necklace," he explains, "is not an ordinary necklace. I never worry about the possibility of its being stolen, because it is always able to find its own way home ! Now watch."

He opens the sugar bag and shows that the necklace has gone. Then going to the box he removes the lid, and there is the necklace safely back again.

How it is done : There are two necklaces, both alike and both, of course, of imitation pearls, such as can be bought for a few pence. The box in which the necklace appears is made as shown in Fig. 1. At each end a strip of cardboard is fixed across, making a sort of turned-over edge. There is a tiny hook fitted at each end of the box under the strip, as shown at "A" in the figure.

At the start of the trick one necklace is hidden at the lower end of the box under the turned-over edge, and attached to the hook. The other necklace hangs visibly in the box from the other hook, as shown in Fig. 2.

When the visible necklace is taken out the lid is placed on the box, which is then stood the reverse way up on the table. Reversing the box brings the other end to the top and the concealed necklace then falls down, so that it is seen hanging in the box when the lid is next removed at the conclusion of the trick.

The paper from which the sugar bag is made is double, being in reality two pieces of newspaper pasted together round the edges. One corner of one of the sheets is then cut off as shown in Fig. 3. When the bag is made up, the cut-off corner comes inside and is opened out like a pocket (Fig. 4). The necklace is dropped into the pocket so that when the paper is opened out the necklace is hidden between the two papers and appears to have vanished.

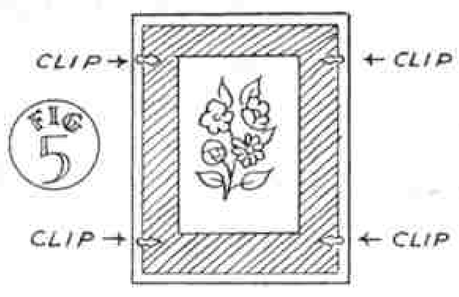
NOBODY'S PORTRAIT

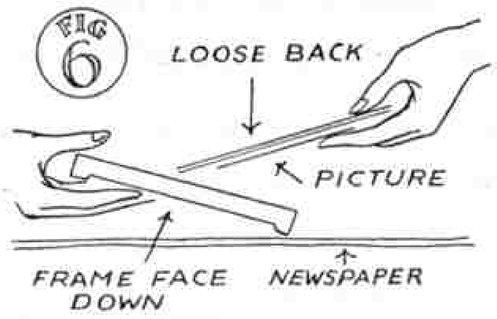
A fair-sized photograph frame is shown to be empty, and in order to put this beyond dispute the conjurer even goes to the length of taking off the back and allowing the audience to look through the glass. The back is then replaced and the obviously empty frame is wrapped in a newspaper.

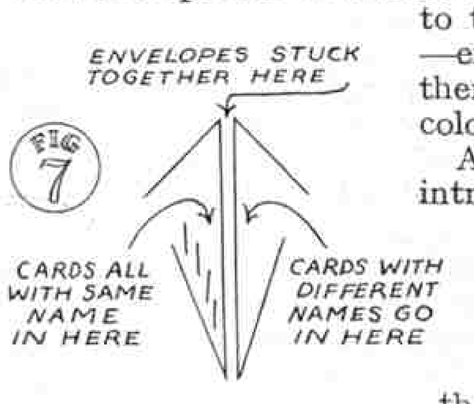
Several small cards are next shown, each card having written upon it the name of a different flower. These cards are then dropped into an envelope and a member of the audience is asked to choose one. We will assume that he picks the card bearing the name "Rose."

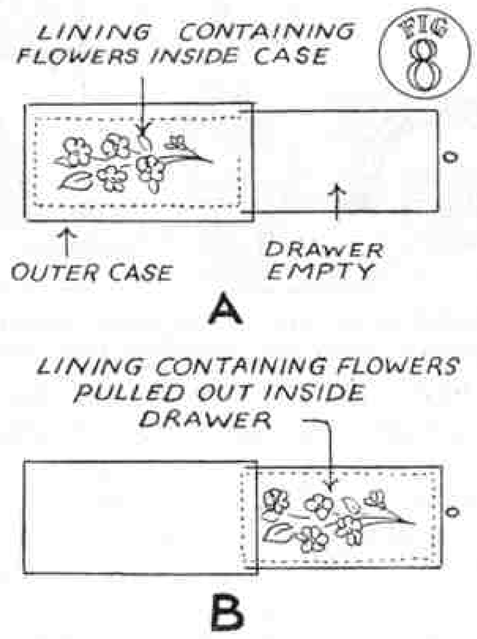
"Think very hard about roses, please," says the conjurer, "and I will endeavour to produce an image of your thoughts in the empty frame that you have just seen me wrap in that piece of paper." He makes a few mystic passes and unwraps the frame, or allows the person who chose the card to do so. Then, to the surprise of everyone —except the conjurer— there, in the frame, is a coloured picture of roses !

A further effect may be introduced into the trick by producing from a box, previously shown empty, a small spray of real roses, to be given as a souvenir of the entertainment to the person who selected the card.









How the trick called "Nobody's Portrait" is performed

How it is done : The frame has a loose back that takes out completely in order to allow photographs to be inserted, and is normally held in place by small clips. Such frames may be bought very cheaply at any fancy goods shop.

Cover both sides of the loose back with dark-coloured plain paper and then stick down on one side of it a coloured picture of roses, or whatever flower you decide to use. Now place the loose back in the frame with the plain side facing the glass, so that the picture is therefore at the back of the frame, as shown in Fig. 5. You can now show the frame, and take out the back in order to allow the audience to see right through the glass, thus convincing them that the frame is empty.

Now place the loose back on a piece of newspaper, picture side down, taking care not to let the audience catch sight of the picture. Having shown the frame, place that face downward on the newspaper, pick up the loose back and fit

it into the frame, keeping the picture side down (Fig. 6). The picture is now in the frame ready to be shown, and all you have to do is to fold the newspaper round the frame and give it to someone to hold. Any member of the audience may unwrap the frame at the end of the trick and discover the picture, without being any the wiser as to how it got into the frame.

The envelope in which the cards are placed is double, being made from two envelopes stuck together by the address sides. One side of this double envelope contains a number of cards on each of which is written the word "rose," or whatever flower is to be used (Fig. 7). The cards with the different names are dropped into the empty side of the envelope, and the other side is presented to one of the audience for him to pick a card. Quite clearly, it makes no difference whatever card is chosen, for all bear the name of the same flower.

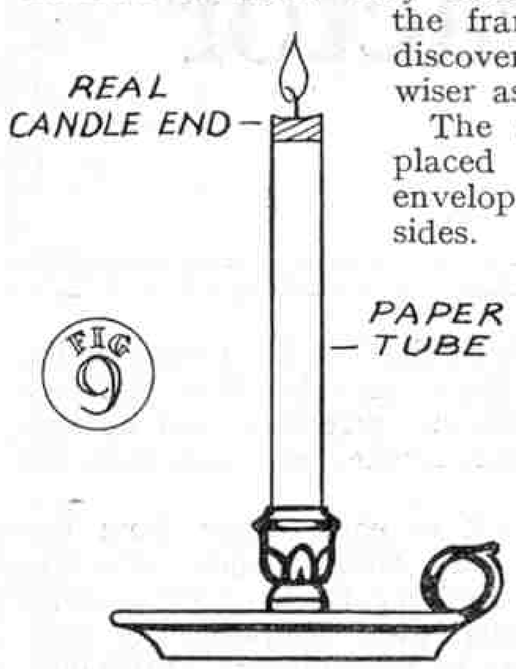


FIG 9

This candle is a hollow fraud that may easily be made to vanish—

The box from which the actual flowers are produced is a simple piece of conjuring apparatus known as a drawer box, and it may be obtained in various sizes, from one shilling upwards, from any conjuring shop. It consists of a box made on the principle of a matchbox, having a drawer inside the outer case. Unknown to the audience there is a lining to the drawer, and this may be drawn out with the drawer or left hidden in the outer case, at the will of the performer. The flowers are placed in the inner lining. The drawer is first pulled out alone as shown in Fig. 8A, when of course it appears empty. It is then closed, and after the trick is again pulled out, this time bringing with it the inner lining and so revealing the flowers, as in Fig. 8B on the opposite page.

THE SWOLLEN HEAD !

After requesting two gentlemen from the audience to step forward to help him with his next trick, the conjurer takes up a tape-measure and asks one of the gentlemen to measure round the head of the other and call out the measurement, which is then noted down.

Gazing earnestly at the gentleman whose head has been measured, the conjurer says: "I want you to forgive my seeming rudeness when I say that your head is swelling. It is not swelling from pride, however, but simply because I am putting a spell on it. Can you feel it getting bigger?"

The victim, of course, replies that he feels nothing, and stoutly maintains that his head is still the same size. When the conjurer's assistant measures it again, however, it is found to be several inches larger than when it was first measured!

The conjurer then removes the spell and thanks the gentlemen for their help, at the same time telling the one who was measured not to worry because the swelling will soon go down!

How it is done : Two tape-measures are required. One of these is quite ordinary and unprepared, while the other is made from a length of tape specially marked so that each inch measures only three-quarters of an inch. In order to ensure that the measures will look alike the best way is to make them both from lengths of the same type, marking one correctly and one as I have just described.

The "faked" tape-measure is rolled up and concealed in the performer's hand before the trick starts. After the gentleman's head has been measured with the correct measure, the conjurer takes this and rolls it up while he is talking. He then gives back to his assistant, not the same measure, but the prepared one, leaving the real measure in his hand. A little later he can get rid of this by placing his hand casually in his pocket to take out a handkerchief. When the measurement is taken with the tape marked with short inches there will, of course, be more of these inches to the same measure, and so the gentleman's head will seem to have grown bigger.

PUTTING OUT THE CANDLE

A lighted candle is burning in a candlestick on the conjurer's table. He takes the candle out of the stick, blows out the flame and wraps the candle in a piece of tissue paper.

"You have seen me put out the flame of the candle," he remarks. "Now I will put out the candle too." With these words he crushes the paper into a ball. The candle has vanished!

If he wishes to do so the conjurer may complete the trick by producing the candle again, alight, from his coat pocket.

How it is done : The candle in the candlestick is a hollow fraud. It is just a tube of shiny white paper with a piece of real candle fitted in the top, as shown in Fig. 9. This piece of real candle is lighted just before the commencement of the trick, and it gives the imitation candle the appearance of being solid and genuine. When the candle has been wrapped up it is only necessary to crumple up the paper for the imitation candle to crumple up inside it.

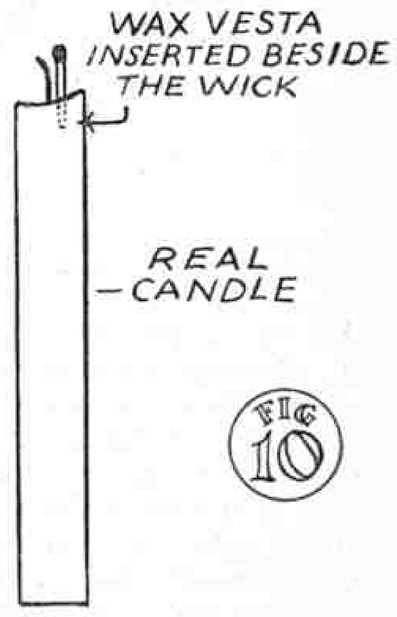


FIG 10

—and this is a real one that may be lit by striking. Both are used in a trick described in this article

To produce the candle—this time a real one—from the pocket, take an ordinary candle and insert a wax vesta with the end just beside the wick (Fig. 10). Place the candle in an inside coat pocket and sew a small piece of sandpaper to the lining of the coat near the pocket. As you take the candle out of your pocket you rub the head of the vesta across the sandpaper. The vesta lights, and ignites the wick.

THE CHOCOLATE DOLL

"I can promise you that you will be able to see through part of this trick," says the conjurer, "because I am going to use this glass tumbler." He shows the glass, and then puts it down and makes a tube from a sheet of paper. Then he fills the glass with bran from a box and covers the glass with the paper tube.

"Now I will show you the advantage of being a wizard," he says. "I can turn this glassful of bran into anything I wish—an elephant, a mutton chop, or, shall we say, a chocolate doll. Look!" He lifts the paper tube and there in the glass is a chocolate doll, while all trace of the bran has vanished. The paper tube is empty, and the doll may be given to someone in the audience who has helped with the previous trick.

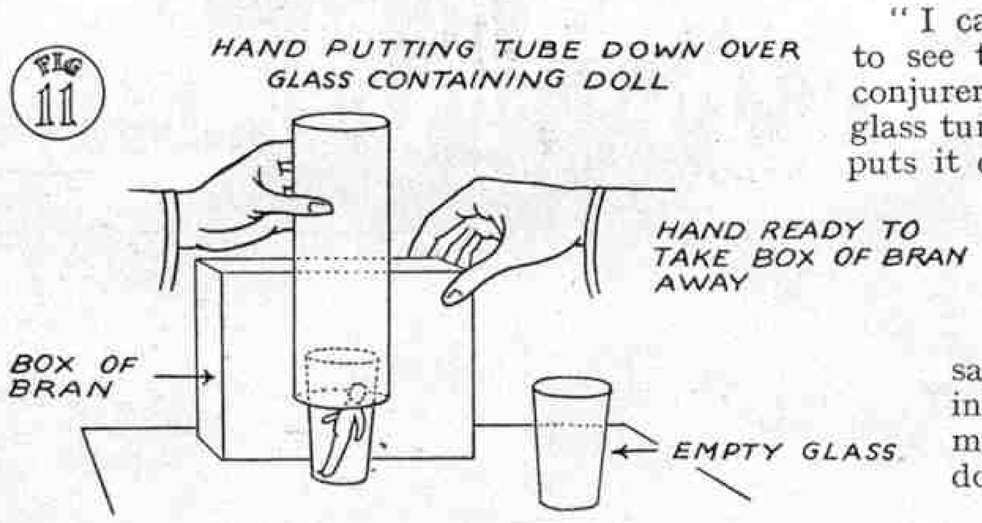


FIG 11

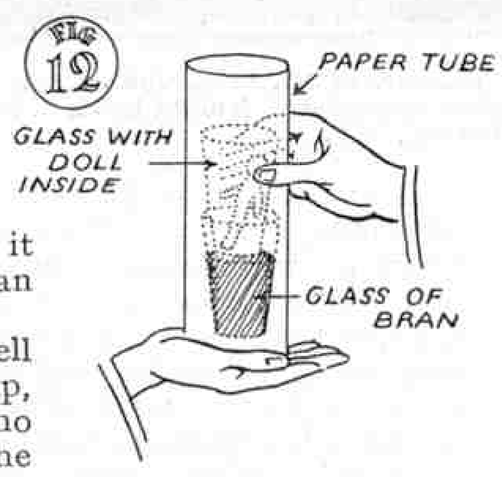


FIG 12

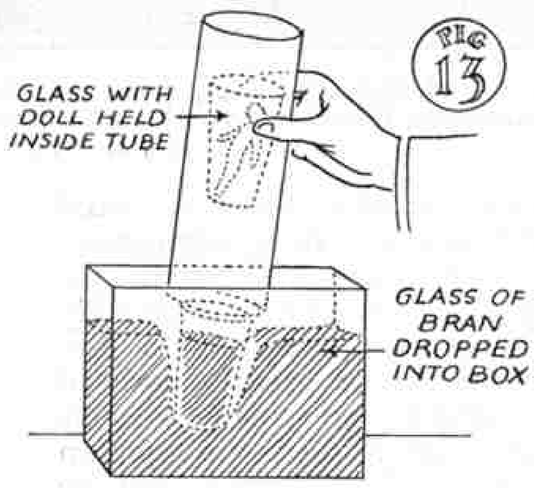


FIG 13

How a glassful of bran becomes a chocolate doll; an easily performed trick that is very effective

How it is done : Two glasses are needed, both exactly alike. At the commencement of the trick one glass containing the chocolate doll stands behind the box of bran, which must be high enough to conceal it from the audience. The conjurer begins by showing the other glass, which of course is empty. He places it on the table and makes a sheet of paper into a tube amply large enough to go over the glass, and secures the paper with pins. He now places the paper tube down behind the box of bran and over the concealed glass, and at once picks up the box as shown in Fig. 11. The visible glass is now filled nearly to the top with bran from the box, the performer putting in a little at a time so that everyone can see that nothing but bran goes into the glass. In removing the bran from the box he keeps taking it from the same place so that a hollow is formed in the bran.

The box is now replaced on the table. The conjurer then picks up the glass of bran with his left hand and the paper tube with his right, pinching the tube to prevent the hidden glass from falling out. He then covers the glass of bran with the paper tube, when of course the glass containing the doll goes into the top of the glass of bran, both glasses being hidden (*Continued on page 954*)

A Great Railway Contractor

The Career of Thomas Brassey

So much attention has been paid to the careers of the great railway engineers—the two Stephensons, I. K. Brunel and others—that the men who actually carried out the constructional work have been pushed into the background. This is unfortunate, because the big railway contractors, especially those of the early days, were of necessity men of strong personality, shrewd and determined, and last but not least, possessed of a very considerable amount of natural engineering ability.

One of the most interesting of these men was Thomas Brassey, who was born at Baerton, near Chester, on 7th November, 1805. Brassey was educated at a Chester school, and at the age of 16 was apprenticed to a land surveyor named Lawton. He displayed such aptitude in his work that when the term of apprenticeship came to an end Lawton made him a partner in the business and placed him in charge of the Birkenhead branch. In Brassey's capable hands this branch developed rapidly, and the many local surveys that he carried out successfully not only won him an excellent reputation, but enabled him to acquire a sound practical knowledge that was very valuable to him in later life.

In addition to being an estate agent and a land surveyor Brassey appears also to have owned the well-known Storeton quarry near Birkenhead. In 1834 he was visited by George Stephenson who, in the capacity of chief engineer of the Liverpool and Manchester Railway Company, was seeking for supplies of stone with which to build the Sankey Viaduct. In common with other railway companies, the Liverpool and Manchester were constructing their own line, and Stephenson found that it was impossible for him to personally supervise the whole of the work. The idea occurred to him that the construction of the railway would be greatly assisted if a portion of the work could be entrusted to some really capable man. On his visit to Storeton quarry he formed the opinion that Brassey would make an ideal railway contractor, and he outlined to him the possibilities of such a career.

In 1833 Stephenson was appointed chief engineer of the Grand Junction Railway, a project involving the construction of a line from Warrington to Birkenhead by way of Crewe. This line was to link up a branch of the Liverpool and Manchester Railway from Newton to Warrington with a proposed line from Birmingham to London. Stephenson then decided to test his plan of sub-letting portions of the work, and suggested to Brassey that he should consult his bankers and with their financial support tender for some of the more important works included in the Grand Junction scheme.

Brassey was greatly attracted by the proposal, and on discussing the matter with his bankers at Chester he found them very willing to support him. Shortly afterward, therefore, he submitted a tender in respect of a large viaduct to be built across the Dutton Valley, but he lost this contract on account of his price being too high. He then submitted a tender for the construction of the Penkridge Viaduct, and this was accepted. Before either the Dutton or the Penkridge viaducts were built, however, Stephenson retired from the Grand Junction Railway owing to differences of opinion with the directors, and he was succeeded as chief engineer by Joseph Locke, who had been his chief assistant.

Brassey and Locke were attracted to each other from the beginning and soon they became very close friends. On the completion of the Grand Junction Railway Locke became chief engineer to the London and Southampton Railway, the construction of which involved contracts to the value of £4,000,000, and the employment of some 3,000 men. Locke lost no time in inviting Brassey to tender for various works in connection with the scheme, and most of these tenders were successful. In order to be more conveniently situated for his work Brassey removed to London in 1836. The contracts were carried out very successfully, and Brassey soon acquired a big reputation. Before the London and Southampton line was completed he was also engaged on portions of other lines in the north of England and in Scotland.

View of Preston Hall, Aylesford, Kent, at one time the residence of Mr. Betts, who was one of the partners in the engineering firm, Peto & Betts. At a later period the house passed into the hands of Brassey's second son, Henry A. Brassey, M.P.

In 1839 or 1840 Locke became engineer to the Paris and Rouen Railway, and once again availed himself of Brassey's services. Some three years later Brassey contracted to complete a line for the Rouen and Havre Railway in two years, the task including the construction of the Barentin Viaduct. This structure has 27 arch spans and is approximately one-third of a mile in length, 50 ft. in width and 112 ft. in height. Work upon it was almost completed when a terrific storm occurred and the structure collapsed. Brassey was informed by French lawyers that he was not responsible either legally or in any other way for the disaster, but he seems to have regarded himself as being under a moral obligation to rebuild the viaduct, which he did in less than six months at a cost to himself of about £50,000.

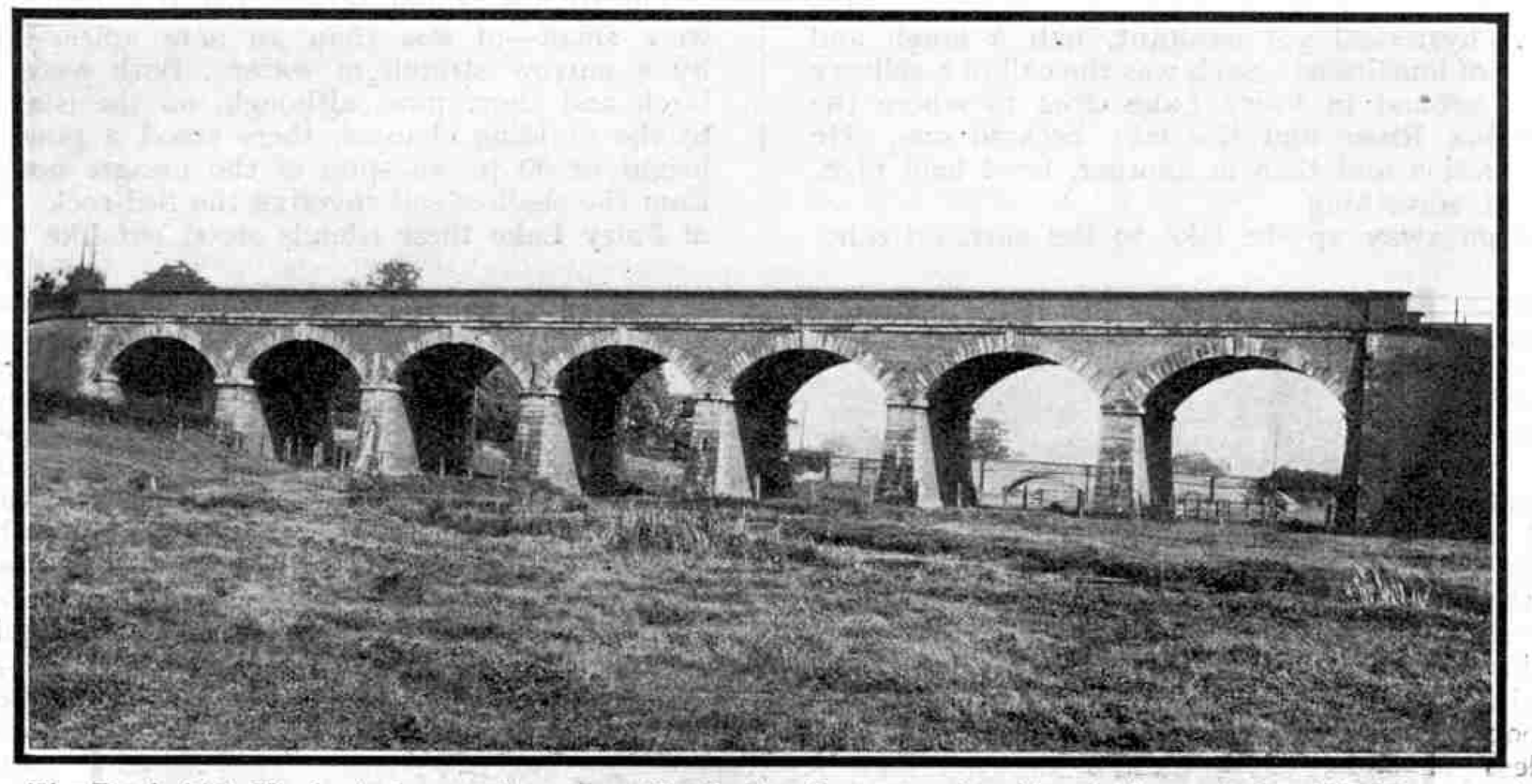
At this period Brassey was experiencing the busiest time of his life. His services were sought after eagerly by railway companies in this country and abroad, and at one time he was co-operating with others in the construction of no less than six different French railways, in addition to carrying out contracts on his own account for the same number of lines in Great Britain. A writer in the "*Builder*," referring to the contractor's activity at this time, says that "the industrial army set in motion and controlled by Mr. Brassey amounted to 75,000 men, and his weekly payments must have distributed, as the price of labour, from £15,000 to £20,000 every Saturday. The capital involved in these various contracts amounted to some £36,000,000 sterling."

Brassey's strong sense of justice and scrupulous honesty, combined with his great ability as a leader of men, were reflected in the affection shown towards him by all whom he employed; while he was held in the highest regard by those who availed themselves of his services.

In November, 1846, the newly formed Great Northern Railway appointed Brassey as contractor for the Peterborough-London

section of their line. This task included the laying of a track across three miles of fenland near Whittlesea Mere, and Brassey entrusted this particular portion of the line to a very capable assistant named Ballard.

The manner in which they laid the track is interesting. At first they proposed to carry the line across the bog on bridges built on piles, for which a special foundation had to be prepared; but this scheme was abandoned in favour of laying the railway along a massive wall or solid embankment. The foundation consisted of alternate layers of wood and peat, 100 acres of faggot wood being cut down to provide the necessary timber. First of all stakes were laid end to end to form a platform, and upon this was laid a layer of peat sods. Then a second layer of stakes was laid over the peat, followed in turn by another layer of peat sods. In this manner a thoroughly firm foundation was built up slowly, sufficient time being allowed before setting each fresh quantity of wood and peat for all water to be displaced.



The Penkridge Viaduct shown above was the first railway construction task carried out by Brassey. It was built as part of the Grand Junction Railway

In an interesting account of the work Ballard says:—"The peat was 22 ft. deep, and I pointed out to the engineer the difficulty of sufficiently bracing the piles, their tops being only about 3 ft. above the soft bog. The piling was given up, and we made rafts of timber on which brick walls were built. These gradually sank, care being taken to so dispose the weight as to keep the walls perpendicular, and finally these walls were tested with rails of a greater weight than that of any train that could pass over them. We did not load too quickly, but left it; we put a little load on, and left it; and then the water had a chance of escaping. We only compressed the peat beneath the raft, without displacing it, for if we had once displaced it we must have gone down to the solid."

The Great Northern Railway had agreed to pay Brassey periodically certain sums of money on account, in order to enable him to carry on with the work, but unfortunately financial difficulties arose and he was obliged to accept the company's bonds in place of cash payments. This state of affairs greatly hindered the work and, although Brassey might have claimed compensation, it was typical of him that he appreciated the serious nature of the company's problems and did not seek to obtain any redress on account of his own difficulties.

Another great undertaking in which he was concerned, in association with the English firm of Peto and Betts, was the construction of the Grand Trunk Railway of Canada. The building of this line included enormous outlay, calculation and labour. It passed through what was then to a large extent new country, and through tracts that were still inhabited by Indians, who were not always too friendly.

Every year the sphere of Brassey's activities increased. In addition to the great part he took in railway work he founded and maintained ironworks, dockyards, coal mines, and various other establishments. He became world-famous and acquired immense wealth, but he retained his quiet, unassuming disposition, and always preferred to live simply amidst modest surroundings. In spite of his wealth and resources there were times when he experienced reverses of fortune, but he never allowed himself to be crushed. We have mentioned his loss in connection with the Barentin Viaduct. Another and even worse catastrophe that occurred towards the end of his life was the failure of the firm of Peto and Betts. This disaster involved him in heavy financial losses, but in spite of these, and the fact that war was then in progress between Austria and Prussia, he successfully completed an Austrian contract.

The accompanying illustration shows Preston Hall, Aylesford, Kent, which was built by Mr. Betts for himself and his family. This modern Elizabethan mansion stands in particularly beautiful surroundings, and originally contained some magnificent pictures by famous artists. It had to be sold after the failure of the firm, and it is interesting to note that it passed into the hands of Mr. Henry A. Brassey, M.P., the second son of Thomas Brassey. The Hall is now maintained by the British Legion, who make excellent use of it in the treatment of pulmonary tuberculosis.

During 1867 Brassey made an extensive business tour and was present at the opening of the Fell Railway over Mont Cenis, which had been constructed under his supervision. The locomotives installed on this railway proved very faulty, and Brassey, who was in poor health at the time, exposed himself unduly to weather conditions in watching the experiments. He was greatly disappointed at the unexpected mishaps that occurred, and this worry no doubt helped to bring about the serious illness and paralytic stroke that shortly afterward overtook him. He recovered for a while, but a further stroke in 1868 again laid him low. Still he refused to relax from business, and in consequence his health collapsed completely under the strain. He spent his last days at his home at Hastings, and died on 8th December, 1870.

Brassey was mourned by men of widely different standing, and perhaps most sincerely by the vast army of workmen who had served under him. He was always conscious of his power as a leader of men in his own particular line of work, but he invariably used this power wisely and for the highest ends. In a large measure the secret of his success was his ability to arouse in his employees the desire to give unstinted service.

First British Turbo-Electric Liner—

(*Continued from page 920*)

The two circulating pumps for the main condensers are each driven by a variable speed electric motor, and are cross connected to allow either pump to circulate both condensers. The auxiliary boiler plant is supplied with feed water by means of steam-driven pumps of the direct-acting type and automatically controlled. The ballast and bilge pumps are of the two-throw kind driven by constant-current variable-voltage type motors.

All auxiliary machinery, with the exception of that driven by Austin constant-current motors, is driven by 220 volt D.C. motors. For the supply of current to the Austin system of motors, three motor-generators each having an output of 150 k.w. at 500 r.p.m. have been installed on the port side of the engine room. At the aft end of the port side of this room is the engineers' workshop equipped with lathe, drilling and grinding machines, all operated by independent electric motors. The ventilation of the engine and boiler rooms is of considerable importance in a vessel using highly superheated steam and sailing in hot climates, and 11 large mechanical ventilators are installed for this purpose.

A comprehensive "Phoneme" foam installation is fitted in the boiler room and oil-pump rooms as a protection against oil fires in these quarters. The tanks containing the chemical solutions are situated on the casing top and contain sufficient material to cover the area of the larger boiler and pump-room with a layer of foam to a minimum depth of six inches.

In her official sea trials the "*Viceroy of India*" attained a speed of 17.1 knots during the six hours' consumption trial, while the fuel consumption was .715 lb. per S.H.P.-hour for all purposes. A speed of 19.62 knots was attained on the full power measured mile trial, when both turbo-alternators were in use.

The ship sailed on her maiden voyage to Bombay on the 28th March last and after calling at various places en route arrived at Bombay on the 19th April. The engines functioned excellently throughout the whole of the trip.

The Twin Sisters of Fairy Lake

An Indian Story

By H. M. Driftwood

A WILD cry sounded out over the lake as the last streaks of day were disappearing in the western sky. It was a long-drawn-out cry, hysterical yet exultant, half a laugh and still rather a wail, full of loneliness. Such was the call of a solitary male loon swimming around in Fairy Lake close to where the waters of the Muskoka River and the lake became one. He swam first in one direction and then in another, head held high, evidently listening for something.

A minute later, from away up the lake to the east, an echo, faintly audible, came back to the loon. With an abrupt turn he swam eagerly towards where the sound seemed to come from. Then he paused a moment, stretched out his neck, and sent a more plaintive summons through the darkening spaces of the approaching evening. It was the mating call. The loon remained motionless until the softened echo repeated his yearning when with much fluttering and flapping, he rose to wing and flew rapidly in quest of his answerer.

Just a small black object hovering above the water he seemed, as he guided his course to the east end of the lake. But he had hardly traversed half the distance when from the south of him came the low, drawing salute of a female loon. For a moment he was bewildered; then he settled on the water. Had he made a mistake in his course? As though in answer to his query an indistinct cry came from the east—the echo, but of this he was not aware. He was right, he thought; the sound came from in front of him. With a high, exultant reply, he spread his wings and with considerable labour raised his body above the water. He would find his mate.

The thought had just passed through his mind when he was baffled again. From the south, to his right, came the same coaxing laugh. Dropping to the water, he darted hither and thither in uncertainty, at length voicing a deep-throated plea that she would acquaint him of her whereabouts. Quickly it came back to him from the south, from behind two small islands appearing as blotches in the lengthening shadows of the gloaming. As he turned to swim in their direction, the eastern hills whispered the note. Undetermined which to seek out first, he stopped swimming. Several times more the female called and he answered, but there was always that confusing one afterwards from up the lake.

Finally on flying to the south, he was disappointed, for in the thickness of dusk he could see nothing of his mate. Keeping a discreet distance from the islands, he swam back and forth expectantly. Then he became impatient and sent out a low, short hail. From the other side of the islands came her response, but when he swam around, the call came to him from a different place. After a time he became silent, for things were not quite to his liking. He had never known a mate to answer as she had and still continue to avoid him. Instinctively his suspicions were aroused, and he began to realise that he was being fooled.

The islands around which this little drama was being unfolded were small—of less than an acre apiece—and were separated by a narrow stretch of water. Both were covered with white birch and short pine, although, on the island to the east, close to the dividing channel, there stood a pine that had reached a height of 90 ft., in spite of the meagre nourishment it received from the shallow soil covering the bed-rock. In the blue expanse of Fairy Lake these islands stood out like little emeralds in the daylight. Their beauty was alluring, and here it was that an Indian maiden used to pass what few idle moments she had, when not collecting firewood or doing the other innumerable tasks that befell the women of the Algonquin tribe.

Scarcely had the Beaver left the shore when the wind whirled across the lake, lashing it into a thing of fury

Dawn, for such was the maiden's name, was enjoying her seventeenth summer of unmarried life, and gloried in her freedom. No brave had been able to win her affections; to all gifts and prizes brought to win her she paid no heed. As soon as her work for the day was done she would roam the woods and learn the ways of the denizens of the forest or, in her canoe, would paddle the lakes and rivers. As a result, she had learned to imitate many things, and sitting at the base of the big pine, screened by the shadows of evening, she was luring the loon by her call. Her eyes shone with happiness at the success of the deception. When she realized the cause of the loon's silence, she broke out into shrill laughter. With a fierce screech like the snapping of a vital chord, which literally cut the twilight, the loon dived out of sight in the deep water. Over the lake the sound reverberated mournfully, in the dead hush that comes before a storm, a sign that Dawn in her pre-occupation had failed to note.

"Wasn't that fine the way we fooled him? Didn't he get a surprise when he found it wasn't his mate?" Dawn cried gaily, as she rose to her feet and patted the trunk of the pine, undisturbed by the peculiarity of the loon's note.

The big tree moaned an unintelligible reply, and from across the lake came a faint whoop of warning from her father, the Owl. He had heard Dawn calling to the loon and had understood how she had misled it. Had she not learned well the ways of the wild things, and proved herself the wise daughter of the Owl! He smiled, but the smile froze on his lips at the sound that made the evening air throb with the anguish of a soul mortally wounded.

As the sobbing cry of the loon reached out across the mile stretch of water to the Indian encampment on the north shore of the lake, a transformation took place around the camp-fires. The older men, like the Owl, jumped to their feet and stood gazing apprehensively across the lake. The uncanniness of the cry awoke a foreboding of evil in young braves; children fled into the tepees; all were filled with a dread of the supernatural.

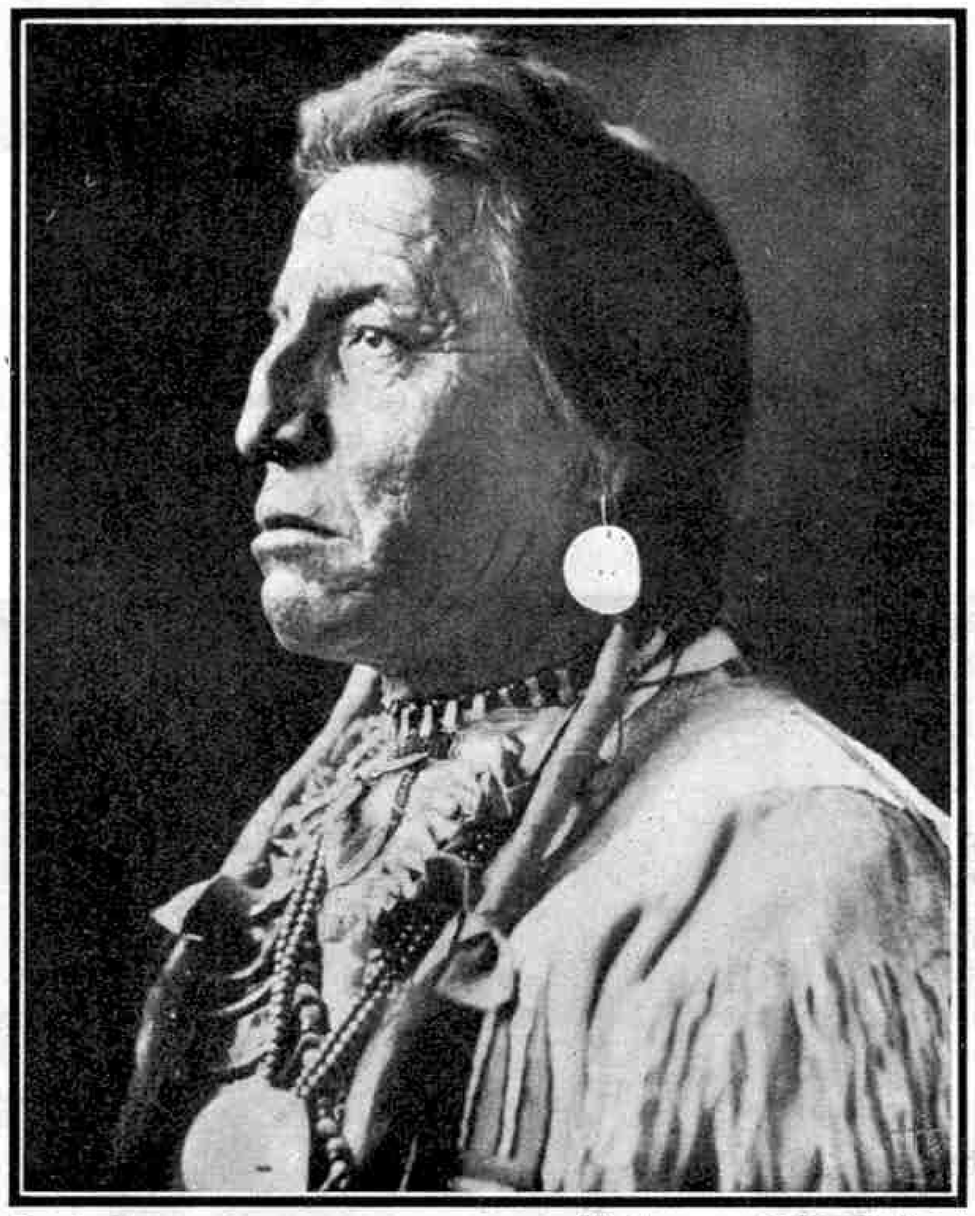
Then spoke the Owl:

"Hear you the death cry? It is the great male loon of Hollow Lake in which dwells the spirit of our old chieftain, Eagle Eye, who was murdered while asleep on the shore of that lake many moons ago. The day he was killed a large male loon appeared on the water, close to where the Eagle had died, and it swam back and forth in front of the spot, refusing to leave. The great Medicine Man of the Algonquins said that our chieftain's spirit had entered the loon's body and that it must never be annoyed or hurt, for whoever bothered it would suffer death. It seldom leaves the border of the lake during open water and its size and call, when aroused, are unforgettable, once seen or heard. No other loon mourns as he does. *That* is what you heard!"

For a moment there was silence, with only the sob of a breeze in the pines around. It was then the Owl had sent out that cry to Dawn.

In an exuberance of good spirits Dawn danced around the foot of the tree heedless of the fact that the moan of the pine was growing louder. Tiring at last, she ceased her frolics and was dismayed to notice the branches above her trembling and the tree-tops swaying in a breeze. The sky overhead was rapidly darkening, and lightning was flashing in the distance. Obviously she must hurry to camp, and pulling her canoe out of the brush she slid it into the water. Stepping into the craft she settled herself squarely and paddled vigorously for the specks of light that marked the fires of her people.

But the contrary and gusty wind made her task no easy matter. It tore at her with a suddenness that threatened to capsize the canoe. With a firm grip on the paddle she challenged the wind and held her course. A quarter of the way across the stretch the wind altered to an overpowering blow from the north; an eddy caught the bow and swung it around like a cork. Dawn tried every trick she had ever learned to turn a canoe into the wind, but all were useless; the wind was driving her back to the starting place. She would drift in behind the islands, she decided, and let herself go with the current.



Courtesy] [*Baltimore and Ohio Railroad*

Chief "*Two Guns Whitecalf*" at the centenary celebration of the Baltimore and Ohio Railroad

Suddenly she became aware that the islands were a good distance to the west of her. She must make them, she told herself. They had been a refuge to her on many occasions before and she felt she would be safe if she gained the shelter of their lee side. With quick, masterful strokes she plied the paddle. The canoe swung part way round as she headed west, but water splashed over the gunwale and little by little deepened in the bottom.

Could she make it? In a hazy silhouette the pine tree on the eastern island stood out above the other trees against the sky. It was her old friend, her sentinel, standing guard and watching over her.

"Oh, mighty tree, you have grown strong in the face of all trials of wind and weather; you have triumphed over the difficulties of life; hear your companion who played at your foot from her childhood; give her strength to overcome the elements; to come to your shelter." So prayed Dawn.

Nevertheless she was blown past the islands; she was outdone by the tempest. The very idea made her blood surge in anger at being beaten. A frenzied effort proved useless against the overwhelming force, so she decided to drift to the south shore.

Had the pine heeded her prayer and given her assistance? Surely it must have, for the wind was gone as abruptly as it had started. With her heart full of thankfulness, she reached the pine and murmured her thanks to it.

As Dawn gained the shelter of her bower, a young brave stepped out from the circle of men around one of the fires at the encampment. The Beaver, for such was his name, was tall, broad-shouldered, and deep chested—an Indian of unusual bearing and strength, and a member of a tribe living on Simcoe's shores. Having heard of the beauty of the Owl's daughter, he had come hither to win the maid. For days he had tried to impress her with feats of arms, and bravery, but she would have nothing to do with him. Although he had been spurned quite openly, now that Dawn was in danger he determined to help her. As he turned his canoe over to push it into the water the Owl gripped him firmly by the shoulder.

"Where are you going?" he asked.

"To find Dawn," replied the Beaver.

The Owl shook his head and tightened his hold.

"No, you must not do that," he said. "The Great Spirit told the Medicine Man that evil and death would follow the ones who tried to turn aside His hand. You will die if you go out there, for the fury of the storm has not broken yet. There is a lull but it will be worse soon. You would never reach or find her, or together you will die for trying to defeat the avenging spirit of Eagle Eye for having been disturbed."

A long, blood-curdling wail pierced the night. It started out low, gradually becoming higher, and then rather suddenly fell away to nothing. Both men started. Their nerves tingled. It was an eerie sound—made by the loon.

Dawn heard it as she reclined at the base of the big tree. Whether it was the wierdness of it she knew not, but filled with a strange fear she jumped into the canoe and paddled like a demon for the tiny points of light on the distant shore where her people mourned. She was conscious of nothing but the memory of that terrible cry not far from her. The unearthliness of it appalled her and she paddled hard to escape it.

At the moment she left the island, the Beaver with a grunt thrust aside the hand that held him and jumping into the canoe sent it speeding in the direction of the islands with the swift, masterful strokes that only an Indian can take. It glided away and the Owl watched with a mingled feeling of respect for the brave who defied the wisdom of the Medicine Man and of doubt of the outcome.

Barely had the Beaver left the shore when, with a mighty rush, the wind whirled across the lake, lashing it into a thing of fury. So violent and sudden did it come that the Beaver nearly lost his balance. It leaped up from nowhere with a swirl and a gustiness that caused him grave concern. The wind was from the north-west and was blowing him straight for the islands. What if Dawn were on the lake paddling into it when it came with such ferocity? He was travelling with the current and the gale, but she . . . . .?

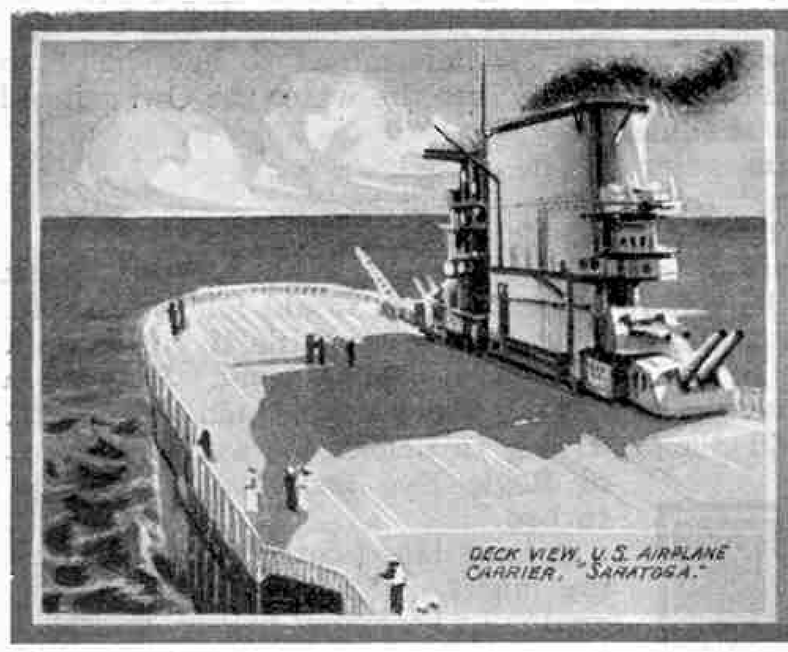
"Great Spirit of the lake," he cried, "Be with Dawn and protect her, if she is still alive: Oh, pine, keep her under your branches until the storm is passed."

A blinding flash of lightning answered him, followed instantly by a crash of thunder. Did his eyes deceive him? Was that spot in the distance the Dawn he sought? Again the heavens were illuminated. No, he was mistaken.

The desire to get away from that weird and hideous sound was all that occupied Dawn's mind. Nothing else mattered. She had not read the signs of more storm as her father had. She leaned forward slightly and inclined her head, throwing every atom of strength into making the canoe speed away. For some minutes she did not raise her eyes and then it was to find that she was paddling to the north-east of the camp. She was right in the centre of the lake. Scarcely did she realize what she had done when the storm broke, and catching the inside of the gunwale, it hurled her without warning into the water.

On coming to the surface she could not see. Realizing her plight, she trod water and kicked off her moccasins. At the next burst of lightning she saw the canoe some distance from her, driving away before the wind. She swam impulsively towards it, but as darkness enveloped all she decided it would be disastrous for her to follow it, for it was drifting away faster than she could swim. Pulling off the gaudy red and blue dress that she had purchased from a trader, she struck out in the direction of the camp. For a while the joy of life surged through her lithe, supple, girlish form as she struggled with the waves. It was exhilarating at the outset, but the wind and the sea slowly weakened her, and she made small headway.

(*To be continued*)



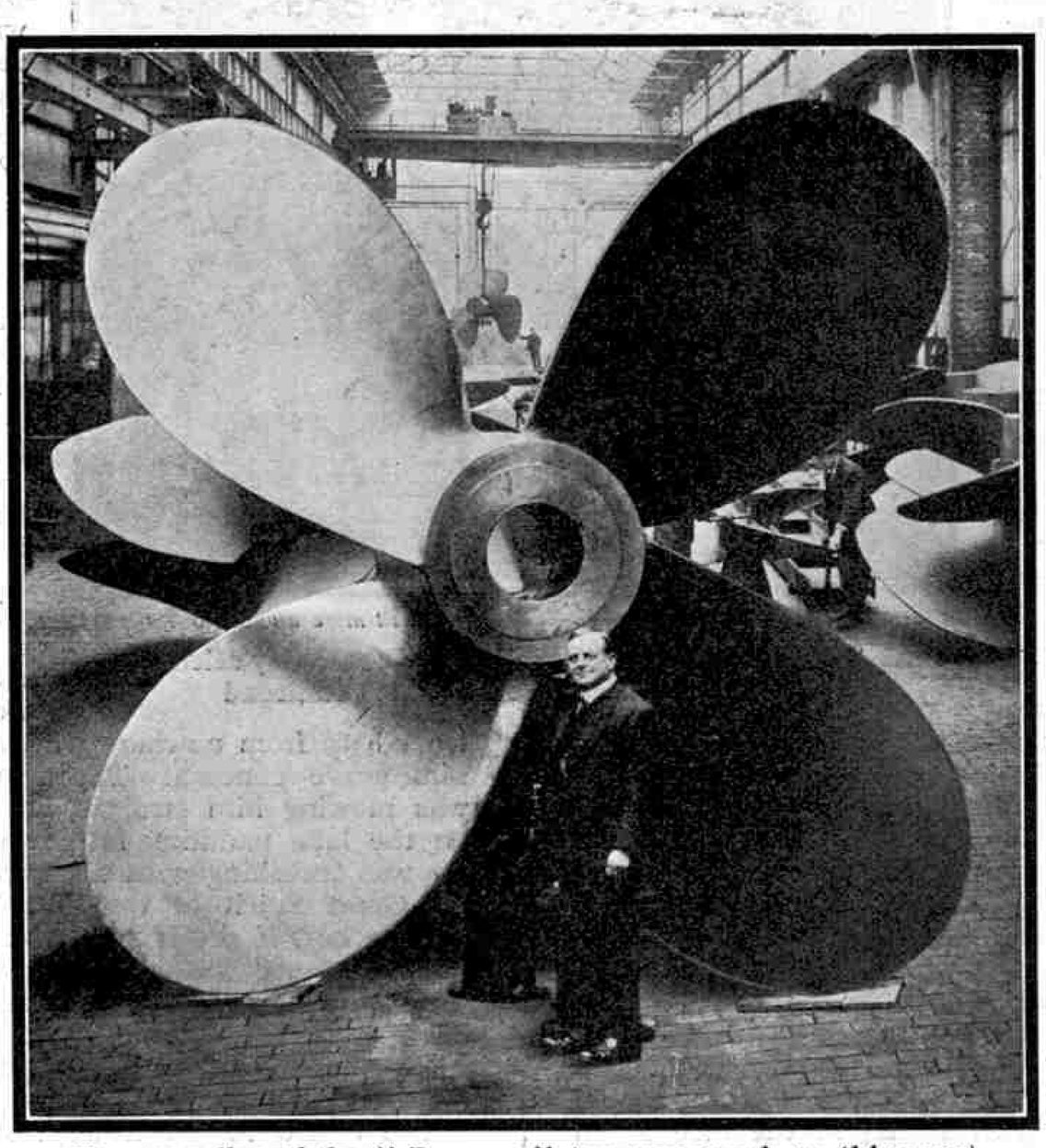
ENGINEERING NEWS

Huge Propellers for "*Bremen*"

The photograph on this page, published by courtesy of the manufacturers, J. Stone & Co. Ltd., Deptford, London, shows one of the large bronze propellers for the new north German Lloyd liner "*Bremen.*" The propellers are made of turbiston bronze, which has special properties that resist the acid action of salt water, eliminating as far as possible the effects of erosion and corrosion.

The casting weight of each propeller was 30 tons and the finished weight complete with cone or gland ring, was slightly over 20 tons. The diameter is 16 ft. 3 in. A high degree of finish was required and also absolute trueness of pitch, the latter greatly helping in the elimination of vibration. Before despatch the propellers were balanced so truly that when on the balancing machines they could be made to revolve by the touch of a finger.

The propellers were planed true to pitch on huge planing machines at the works of J. Stone & Co. Ltd., and it is interesting to know these machines are the only machines of their kind in the world.



The propeller of the "*Bremen*" (see paragraph on this page)

New White Star Liners

The announcement is made that work on the new 60,000 ton liner under construction for the White Star Line has been suspended. It is stated that the work has been stopped in order to give the Directors of the company time to arrive at a definite decision in regard to the comparative merits of steam turbines and oil engines as prime movers. Readers will remember that some time ago it was announced that the vessel will be propelled electrically, but nothing was then said about the manner in which current will be generated.

When completed the much discussed giant liner will be called the "*Oceanic.*" Work is now proceeding on the construction of a sister ship to the motor vessel "*Britannic,*" which was described in detail in the November issue of the "*M.M.*" Both new vessels are being built in the Belfast yard of Harland & Wolff Ltd., and it is expected that the construction of the smaller vessel will be completed before work on the "*Oceanic*" is recommenced, even if the decision in regard to the propelling machinery is made in a very short time.

Salvage Work on the "*Celtic*"

The White Star Liner "*Celtic,*" which went ashore off Queenstown in December, 1928, has not yet been refloated. The original intention of the salvage engineers in charge of the work was to take off the dismantled parts of the vessel by means of a large Dutch floating crane, and then to refloat her with the aid of a number of air chambers.

The earliest efforts were made with the crane on the seaward side of the "*Celtic,*" but weather conditions made this course unadvisable, and the floating crane has now been moored on the lee-side of the vessel. All moveable parts are being lifted on to pontoons by means of a smaller crane, capable of lifting five tons, which has been fixed on board the "*Celtic.*" When enough material has been taken off the vessel, she will be refloated by means of compressed air.

Progress has been hindered to a certain extent by unpleasant odours arising from decaying foodstuffs, and it was only after the air had been made sweeter by the use of chemicals that the men were able to proceed with their work.

Concrete Tunnel Sunk in Position

A vehicular tunnel of special interest was opened for traffic a short time ago in California. It connects Oakland and Alameda, two cities that are separated by an arm of the Bay of San Francisco. It is made throughout of concrete and is chiefly remarkable because the under-water sections were pre-cast in a dry dock, sealed and sunk into the position they were intended to occupy. Including approaches, the tunnel is 4,436 ft. in length, and its external diameter is 37 ft. The section actually under water is 2,436 ft. in length.

The preparation and sinking of the under-water portion of the tunnel was a very interesting operation. This was made in 12 sections, each of these being 203 ft. in length, and weighing 5,400 tons. They were sunk into a trench that had been cut to a depth of 35 ft. to 40 ft. across the bed of the river. Originally it had been intended that the tunnel should rest upon a concrete foundation, but owing to certain engineering difficulties, eventually it was decided to fill in a portion of the trench with sand and the greater part of the under-water portion of the tunnel rests on a bed of this material. Only two sections on the Alameda side of the tunnel are laid on concrete.

The tunnel itself is divided into three longitudinal compartments. The middle section carries the roadway and the others are used for ventilation purposes, a stream of air passing continuously from the lower one, through the main tunnel and thence into the upper section. The roadway is 24 ft. in width, and on each side is a footway for pedestrians.

The painting of the main tunnel was a task of some magnitude, for the area covered is 27,000 sq. yds. With the aid of a hand spraying plant operated by compressed air it was accomplished in 17 days.

New Rhine Bridge

The well-known bridge of boats across the River Rhine between Mülheim and Rieho, which has been in operation for a period of at least 40 years, has now been replaced by a cable suspension bridge, 4,000 ft. in total length and 89 ft. in width. The bridge has a span of about 1,032 ft. and has cost £500,000.

The "*Bremen*" in the Floating Dock

The new 46,000 ton liner "*Bremen*," one of the formidable sisters which have been built for the North German Lloyd, reached Southampton from Bremerhaven on July 1st, and proceeded straight into the 60,000 ton floating dock to have her hull cleaned and painted. The vessel is so large that there are only three dry docks in Europe capable of holding her—one at Hamburg, which at the time was occupied by her sister ship, the "*Europa*," one at Rotterdam, and the third at Southampton. The "*Bremen*" was the first liner flying a foreign flag to be accommodated in the Southampton Floating Dock.

The "*Bremen*" is remarkably interesting from the point of view of dimensions, for although her tonnage is only 46,000 tons, she has a length between perpendiculars of 888.1 ft., beam of 101.7 ft., and moulded depth of 53.7 ft. Her width is greater than that of any other merchant vessel afloat, being about 6½ ft. in excess of that of the "*Majestic*." From the point of view of external design the "*Bremen*" is a fascinating study, for she has a very bluff bow, which falls into a bulb under water. Her lines are very pleasing, and the interior of the vessel is magnificently appointed.

The "*Bremen*" called at Southampton on July 17th from Bremen, en route to Cherbourg and New York, on her maiden voyage with 1,800 passengers, which is significant of the interest evinced in her entry into the North Atlantic trade, and, as reported in our issue of October, broke all records for the crossing from Cherbourg to New York, taking four days 17 hours 42 minutes for the voyage. For 20 years the record has been held by the British Cunarder "*Mauretania*," but the British vessel was beaten by 8 hours and 52 minutes. The "*Bremen*" also set up a new record for the Cherbourg-New York passage in October when, following a course about 75 miles shorter than the usual one, she made the crossing in four days 17 hours 24 minutes.

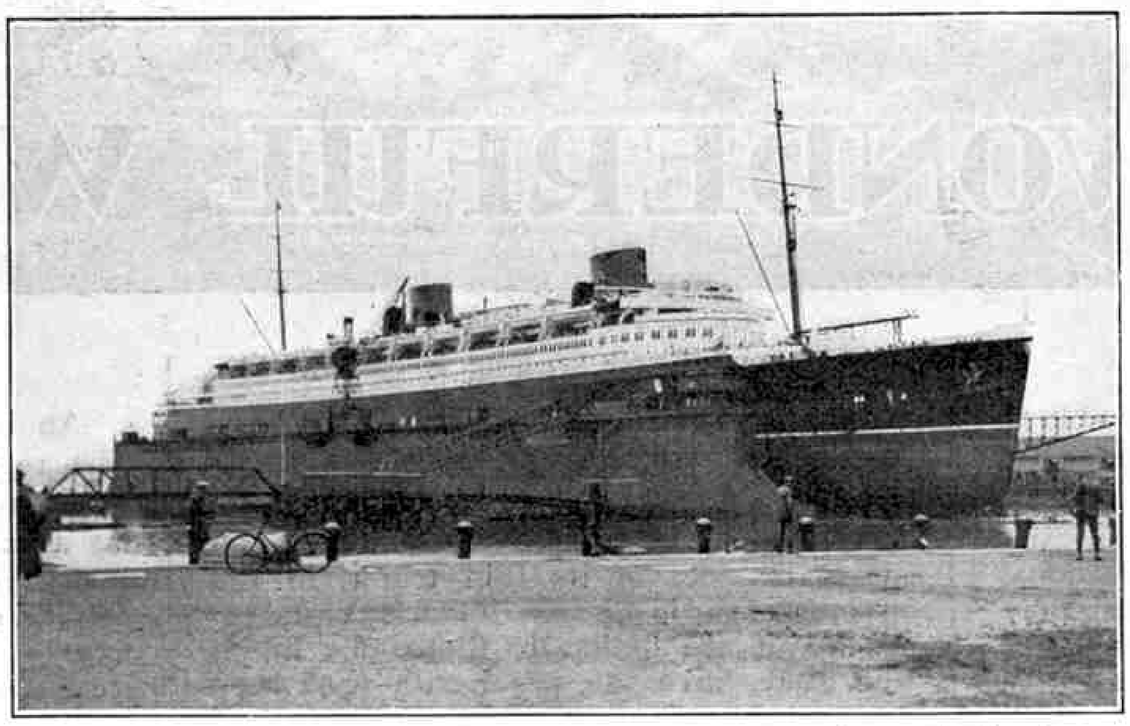
It is interesting to note that the White Star liner "*Majestic*" arriving at Southampton on July 16th, brought a total of 2,326 passengers, which is a record number of passengers to cross the Atlantic in a single ship.

Eight Champions

The week ending July 20th was an extremely interesting one in shipping at Southampton, for eight of the vessels using the port were "record holders" in one sense or another. The Union Castle liner "*Carnarvon Castle*" which reached Southampton from Capetown on the Monday, is the largest vessel in the South African trade, while the White Star liner "*Majestic*," is, of course, the greatest liner afloat. The Canadian Pacific "*Empress of Scotland*" is the biggest vessel sailing to Canada. The North German Lloyd liner "*Bremen*," which called on her maiden voyage to New York, is the largest vessel built in Germany since the war, and also the biggest ship ever owned by the Lloyd. The White Star "*Homeric*," which sailed for the States on Wednesday, is the largest twin screw liner afloat.

Quebec Bridge Open to Motor Traffic

The world-famous Quebec Bridge across the River St. Lawrence was opened recently to motor traffic, the construction of the new highways having been completed by the Government of the Province of Quebec at a cost of approximately £125,000.



The "*Bremen*" in the Floating Dock. For this and the lower photograph we are indebted to the Southern Railway Magazine

Until work on the approaches has been completed, motor cars are allowed to pass over only during the day-time.

The Quebec Bridge is the connecting link in rail transportation between the north and south sides of the St. Lawrence river, carrying the double track of the main line of the Canadian National Railways. It will now similarly serve highway traffic, cars being able to reach the south shore and the main highways to the Gaspé peninsular, New Brunswick, Nova Scotia, and the eastern United States, without recourse to the ferry boat, which formerly provided the only means of crossing the river for vehicles east of the Victoria Bridge at Montreal.

An end view of the "*Bremen*." Note the bulbous underwater portion of the bow

World's Longest Lock Opened for Traffic

The longest lock in the world now is that known as No. 8, on the Welland Ship Canal. This was opened recently, the first vessel to pass through it on her way from Lake Erie to Lake Ontario being the S.S. "*Meaford*" of the Canada Steam Ship Lines. The new lock is 1,380 ft. in length, and is 30 ft. longer than the largest at Sault Ste Marie, which previously ranked as the longest in the world. It has been completed with an eye to future requirements, for its size is such that when placed end to end the two longest vessels operating in the Great Lakes may be accommodated in it.

The opening of No. 8 lock marks another stage in the progress of the Welland Canal, for now a portion reaching from Port Colborne to Ramey's Bend will come into use. Port Colborne is on the shore of Lake Erie, and the new lock controls the level of the water in a section of the canal that ends at Thorold, which is at the top of the Niagara escarpment. This point is the beginning of a section in which seven lift locks have been installed to enable vessels to overcome the difference in level of 325½ ft. between Lakes Erie and Ontario.

It is expected that the new Welland Ship Canal will be open for navigation in the summer of 1930. Until that time the descent of the Niagara escarpment will continue to be made through the locks of the old canal constructed 42 years ago.

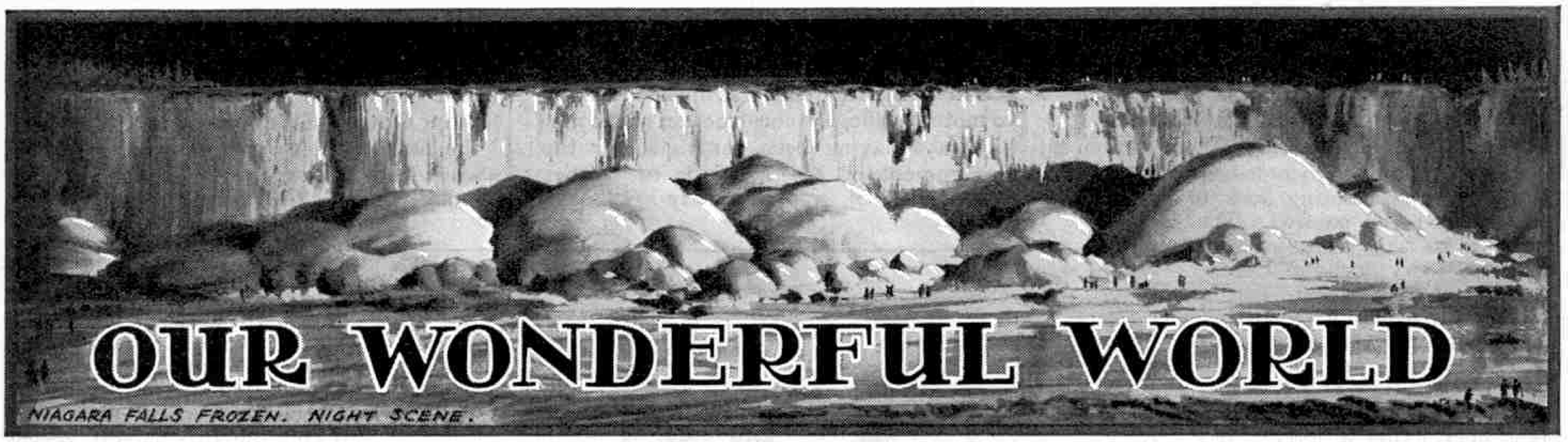
Ship's Overland Journey of 725 Miles

A remarkable feat of transportation recently carried out was the shipment of a vessel 200 ft. in length from Southampton to Central Africa. The shipbuilders concerned were John I. Thornycroft & Co. Ltd., who built the vessel, dismantled it, and shipped the parts to Mombasa, from which port they were taken overland to the shores of Lake Albert, 725 miles in the interior of equatorial Africa.

The first part of the overland journey from Mombasa was made by rail, but road transport offered the only means of conveying the sections over the last 75 miles. In order to avoid trouble from obstacles on this part of the journey the sections were limited in size, the maximum dimensions allowed being 30 ft. by 6 ft. by 9 ft. 6 in. Each section was numbered before dismantling took place, and no difficulty was experienced in reassembling them.

The "*Robert Coryndon*," as the ship is called, is fitted with twin screws and is 207 ft. in overall length, 32 ft. in breadth and 9 ft. 6 in. in depth. The vessel has a dead-weight of 280 tons, and is fitted with a straight stem, the stern being of the cruiser type. Accommodation is provided for a crew of 50 men and boys, while 36 passengers also may be carried.

The vessel's propelling machinery consists of two sets of Thornycroft triple-expansion surface condensing engines, developing a total indicated horse power of 880. The necessary steam is provided by two Babcock and Wilcox boilers.



Living Electric Batteries

A surprising number of fishes are able to produce electric currents that are powerful enough to paralyse small animals. These fishes are nothing but living electric batteries in which certain muscles have been modified in such a manner that they have become a bundle of tiny voltaic cells. In these the tips of the muscle fibres themselves have become discs or plates that act as electrodes, while tiny drops of fluid present in every living cell constitute the necessary electrolyte. In shape the cells are six-sided prisms, and they give off an accumulated electric charge when nerves leading from them to the brain or spinal column are stimulated. The current may be produced at will by the fish, and is used for the double purpose of protection against enemies and for giving shocks to the smaller creatures that serve as food.

The best known electric fish is perhaps the torpedo, which inhabits warm portions of the oceans. Its electric batteries are situated in wing-like projections on its sides, and develop as much as from 30 to 80 volts. The current produced is capable of lighting a small electric bulb.

An even more powerful current may be derived from the batteries of the electric catfish found in the Nile. They surround the entire body of this remarkable fish and are capable of developing 200 volts. The discharge current passes from head to tail, returning through the water; and it is sufficiently strong to produce a spark when the head and tail of fish are connected by a wire that is interrupted by a small gap and also to influence a magnetic needle.

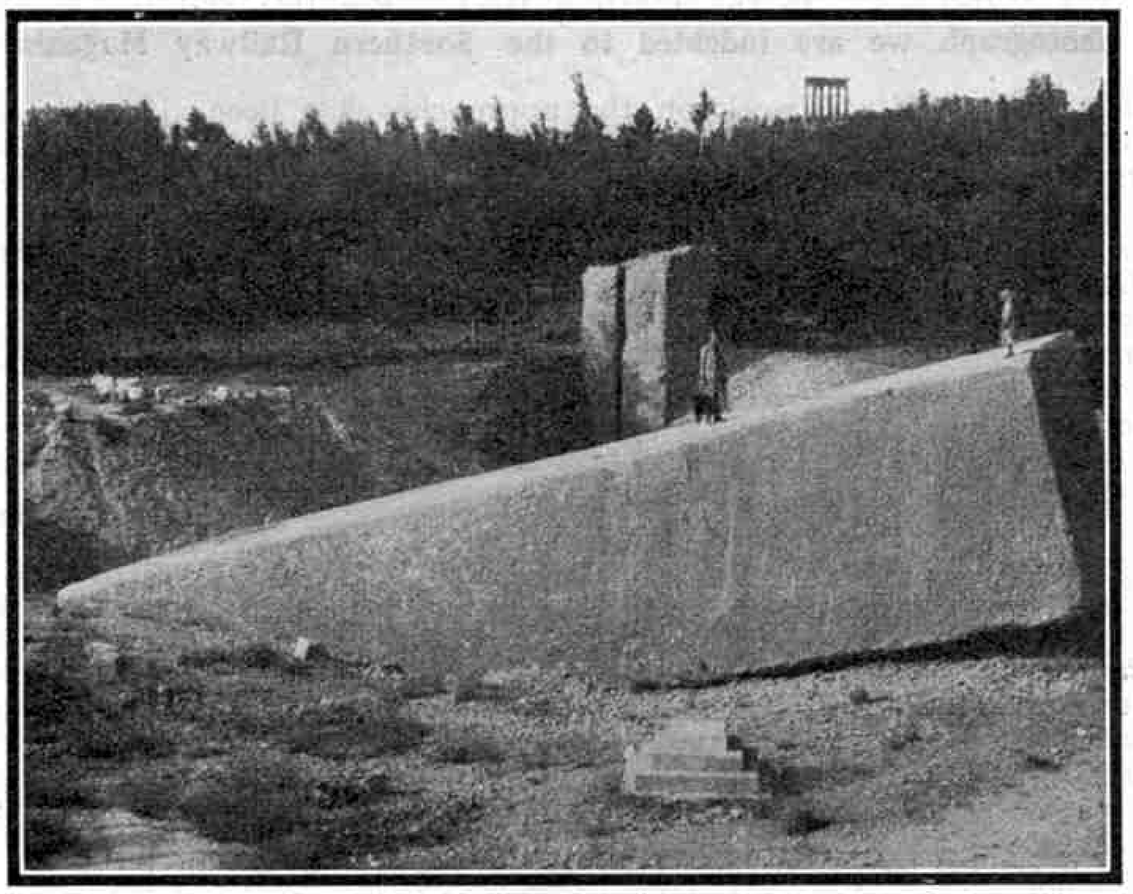
The most powerful and dangerous of these strange creatures is the electric eel found in South America. This fish, which is not a real eel, actually generates current at 300 volts that is sufficiently powerful to paralyse small animals instantly and to kill them by repeated shocks. In its native rivers it is much feared, and instances have been known where horses and mules crossing fords have received a number ot shocks of such violence that they have fallen into the water and have been drowned. The fish grows to a length of 4 ft. and in view of its deadly character it is not surprising to learn that no less than four-fifths of its bulk are taken up by the generating plant. There is indeed, scarcely room in its body for the muscles that operate the fins!

How Lifebelt Stuffing is Grown

As stuffing for cushions, feathers have been largely displaced by kapok, a material obtained from a tropical tree whose branches stick out at right angles on alternate sides of its thin trunk, in the manner of the ideal trees drawn by children. Its leaves are similar to those of a lupin, and they have the peculiarity that they fall off before the flowers appear, while new ones do not grow until the pods are ready to burst.

On the large plantations of kapok trees in Java the pods are gathered when they are on the point of bursting. They are brown in colour, 6 in. in length, and 3 in. across. The seeds are about the size of peas, and are embedded in the silky white fluff that goes by the name of kapok. The down is separated from the seed by machinery and exported. The natives clean large quantities of it for their own use by twirling the pods round and round in a big basket with the aid of a pronged stick. The seeds fall to the bottom of the basket, and the fluff is exposed to the sun in a second basket, when the heat opens it out.

Exposure to the sun will restore the original qualities of the kapok in cushions that have become lumpy and hard. The fluff is waterproof, and is used very largely for the stuffing of lifebelts, to which it gives a buoyancy equivalent to that produced by cork.



The largest block of stone ever quarried, estimated to weigh 1,500 tons. It was found in an ancient Syrian quarry at Baalbec near the ruins of a Temple of the Sun

Novel Use for Photography

An important part of legal processes is the registration of documents and deeds in Record Offices set apart for the purpose, as a safeguard against loss or mutilation. Until recently it was necessary to make copies of the documents, and these were stored in registries for future use or reference. Now the work can be done more expeditiously by means of photography.

The first deed registry to make use of the new method is situated near Detroit, the famous American city of motor cars. There machines have been installed that make photographic records of both sides of any legal document. These copies are flawless and are more durable than either handwritten or typewritten copies of the originals. A specimen photographic record has been exposed outside the building in all weathers for a considerable time, but to-day it may be read as easily as on the day when it was first exposed.

The adoption of photographic recording brings about a great saving of time and money. At registries employing cameras instead of a large number of typists with noisy machines, only a small staff is retained in order to deal with documents that are too indistinct to be photographed. Other interesting features of the process are that forgery and other irregularities may be detected in the photographic prints, while the inevitable typists' errors are absent, unless they have been made in the original.

Lobster Migrates Through Suez Canal

For one of the results of the building of the Suez Canal it was necessary to wait for 13 years. This was the establishment in the Mediterranean of a species of lobster previously unknown to exist outside the Red Sea!

The opening of the canal placed in communication two inland seas of different character, one of which was connected with the tropical Indian Ocean, while the only outlet of the other was to the much cooler waters of the North Atlantic Ocean. The result has been an interchange of sea life between the two, and several specimens of fish and shell fish now found in the Mediterranean have definitely been recognised as original inhabitants of the Red Sea only. The lobster already referred to is now very abundant along the coasts of Syria and Egypt.

Boats Provided With Eyes

There is scarcely any part of the world in which the custom of decorating the bows of boats with eyes cannot be traced. The Chinese adorn their junks and sampans in this manner; instances may be found in India and Madagascar; and the fishermen of many countries in Southern Europe still paint either an eye, or a star to represent it, on the bows of their boats.

The practice of giving eyes to boats is very ancient, and has been traced back as far as the very earliest days of civilisation in Egypt and India. It is probable that in very early days boats were supposed to be more than inanimate objects, and that a superstitious belief arose that the provision of eyes rendered them safer and more reliable. From the Egyptians the custom passed on to the Phœnicians, and thence to the Greeks and Romans, who decorated their galleys with very realistic paintings of eyes.

There is no doubt that at one time the custom spread over the whole of the Mediterranean Sea, and it may still be traced in Portugal and Sicily. There are very few Spanish boats adorned in this manner, but eyes are still painted on the bows of sardine-fishing boats of one village on the eastern coast of that country. These are long vessels, built on the lines of the galleys that once were common in the Mediterranean Sea; and probably the custom has been inherited from the builders of the galleys of Roman times.

It is a curious fact that boats with eyes are not met with in the eastern portion of the Mediterranean. The reason for this is that Mohammedanism places a ban upon the representation of any living thing. This also explains why boats with eyes are no longer found in the Red Sea, the Persian Gulf, and among the islands of the Malay Archipelago, for in these places Mohammedanism is the predominant religion. In other places the spread of education is the cause of the decay of the picturesque custom of seeking protection by painting eyes on the bows of boats.

Alligators Need Protection !

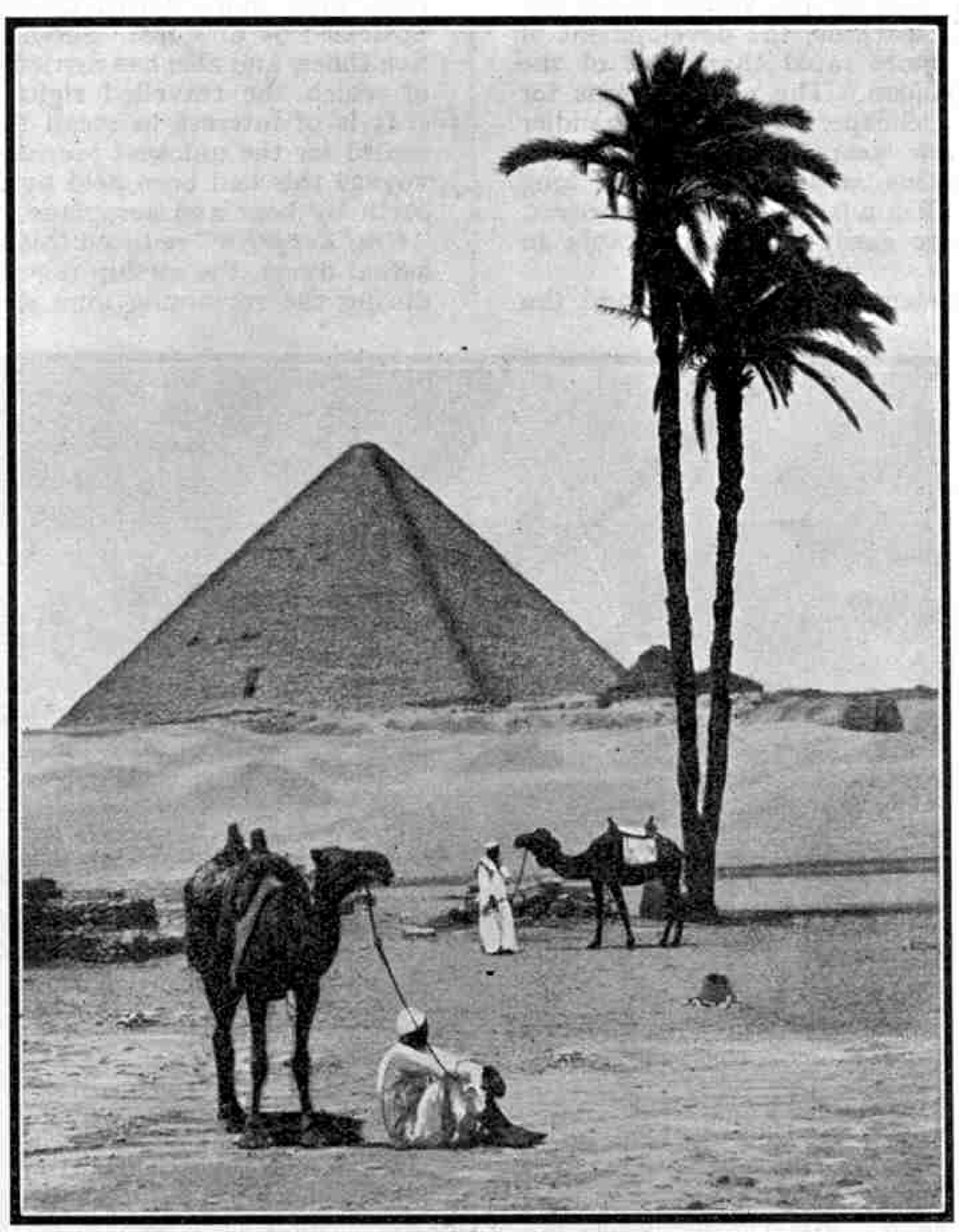
During 1928 the skins of a million alligators were used in making shoes, bags, and other articles intended for the use of women. If the alligator population of the world is to be depleted at this rate it will not be many years before this creature becomes extinct. Few of the reptiles are sufficiently large to give good hide until they reach the age of 20 years, and at the present moment the average age of alligators captured for the sake of their skins is very nearly 50 years. The slow growth of the reptile thus makes it certain that, unless steps are taken to prevent indiscriminate slaughter the supply of skin will shortly come to an end.

More than 1,000,000 lizards and 800,000 snakes also were slaughtered during 1928 for similar purposes.

World's Most Wonderful Train !

The practice of naming towns and villages in developing countries after those in the native lands of the settlers occasionally leads to some very curious results. For instance, in Mr. Allen's article on the "*International Limited*," in the February, 1928, "*M.M.*," he writes: "At Valparaiso a fresh dining car is attached in place of the one we lost at London, in order to provide for our breakfast; and at 7.25 a.m., 22½ hours after leaving Montreal, we pull into Chicago." Anyone reading this might well be excused for imagining that the "*International Limited*" travels through Europe and both North and South America, for the best-known London is of course in Great Britain, the most famous Valparaiso is in Chile, while Montreal and Chicago are in Canada and the United States respectively. A train passing through all these places would be an "*International Unlimited !*"

The London referred to is, of course, the Canadian town of that name, and it is not surprising to find that it also stands on the banks of a river known as the Thames. It lies on the railway between Toronto and Chicago, but instead of millions of inhabitants it contains only about 40,000. The Valparaiso through which the train passes is a town near Chicago, of about 7,000 inhabitants. Thus the journey from Montreal to Chicago, "via London and Valparaiso," may be made without passing through tunnels bored under the oceans !



One of the engineering wonders of a past civilisation—the Great Pyramid of Cheops, the largest mass of masonry in the world. Originally it was 482 ft. in height, and many of the blocks of stone of which it is built weigh 50 to 60 tons

Draining the Mediterranean Sea

All Meccano boys know that modern engineers are ready to attempt almost any task, but a suggestion has now been made that has no parallel except in the stories of Jules Verne. This is no less than to close the outlets of the Mediterranean Sea by huge dams, and to run a portion of the water into the Sahara Desert by means of canals in order to make that barren land as fruitful as a country in such a congenial climate should be. The author of this scheme is a German engineer named Herman Soergel.

When the plan is seriously considered it is realised that, after all, it is by no means impossible. The two outlets that must be closed are the Straits of Gibraltar and the Bosphorus. At each of these it would be necessary to construct immense dams, for by the removal of water for irrigation purposes the level of the Mediterranean would be lowered by as much as 600 ft. This would mean that large areas of land would be added to the continents of Europe and Africa.

Of European countries Italy and Greece would be the greatest gainers. The shallow Adriatic Sea would almost disappear, and Italy would recover a strip varying in width from 12 to 25 miles along its western coast, which probably would become useful agricultural land.

It would be necessary to provide means of keeping open communication between the Atlantic and the Indian Oceans by way of the Suez Canal, and this would be done by constructing a series of canals along the northern shore of Africa. The Suez Canal itself would require modification in order to adapt the Port Said entrance to the new level of the Mediterranean. For this purpose enormous docks would be constructed at Port Said, while others would be required at Gibraltar.

If the scheme is ever carried out it would practically mean the disappearance of the venerable Mediterranean Sea, which ages ago extended thousands of miles to the east. Little by little it has shrunk from the huge dimensions of an ocean to those of a comparatively small inland sea, and the effect of the German engineer's proposal would be to cause it to diminish still further.

"Some" Newspaper !

To Mexico belongs the honour of planning what will be the largest newspaper in the world in point of size, for it is to measure 6 ft. by 9 ft. and will be printed in large size type. It is intended that this enormous newspaper shall be pasted on walls and notice boards in every town and village throughout the Republic. Its production is part of a campaign that is to be undertaken by the Ministry of Public Education in order to raise the standard of Mexican education and to encourage reasonable recreations. It is hoped that this newspaper will encourage the growth of a sense of citizenship.

"R.100": Britain's Greatest Airship

Giant Dirigible Designed to Carry 100 Passengers

IN the 26 years that have passed since Orville Wright made the first flight in a heavier-than-air machine, the development of the aeroplane has been much more rapid than that of the much older airship, or dirigible balloon. The chief reasons for this are that the aeroplane is smaller, cheaper, speedier and handier than its rival. Within the last few years more attention has been given to the problem of making airships capable of long and sustained flights in safety in all kinds of weather, however, for such flights may be made more easily and comfortably in this manner than in an aeroplane.

The modern airship is a development of the balloon, and the first ascent of one of these ungainly and unwieldy vessels was made as long ago as 1783. In the 146 years that have elapsed since that date progress has been so slow that airships built at the present time can still be regarded only as pioneer vessels. Early efforts were made to fit balloons with fins and rudders in order that they could be steered through the air in any required direction. These failed, partly owing to ignorance of what was required and partly because of lack of power. For instance, it was useless to try to propel a balloon by means of large wooden oars, as one hopeful inventor quite seriously attempted to do.

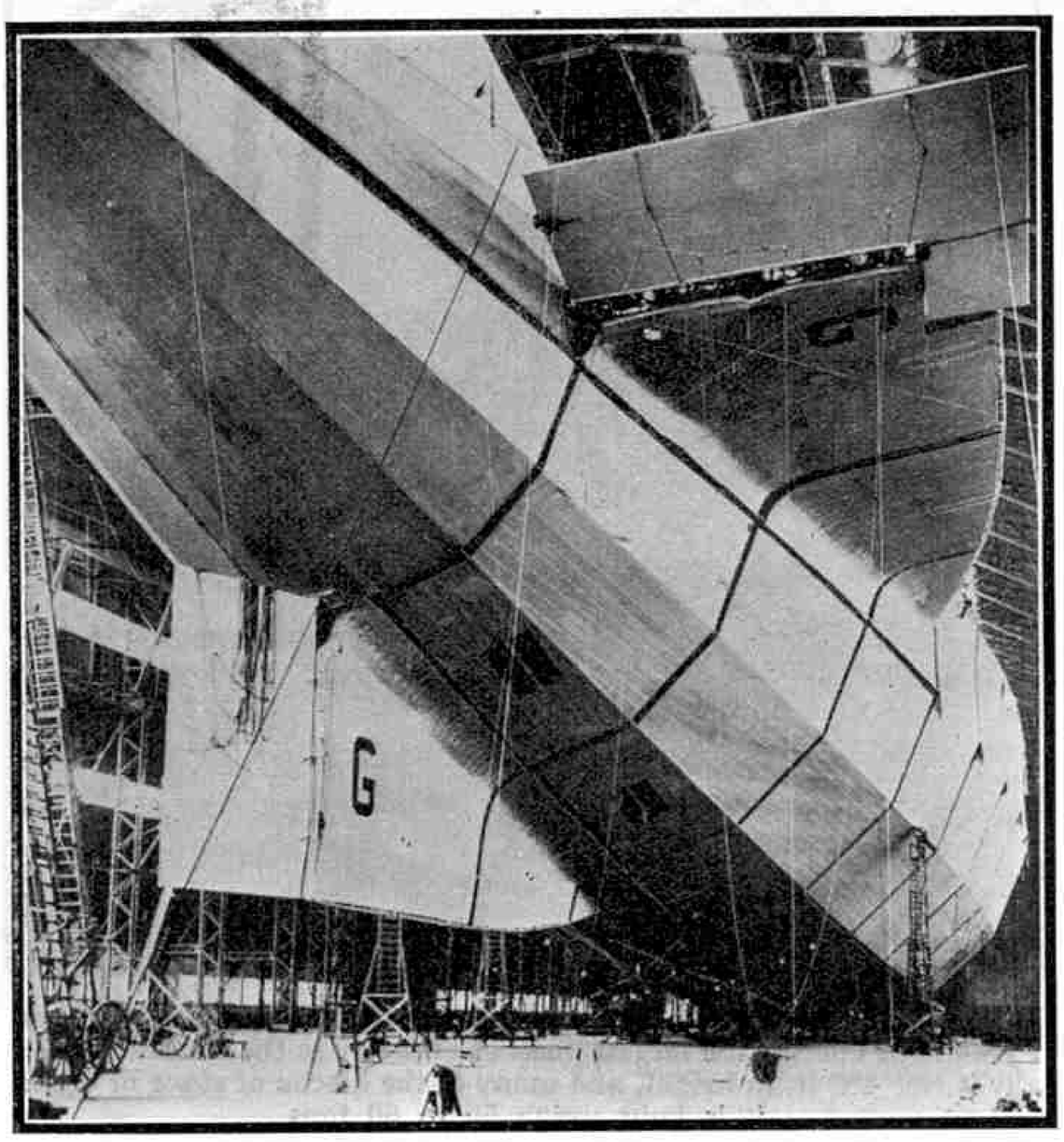
When steam engines became efficient they were too heavy, and it was not until the petrol motor was invented that a light engine of sufficient power became available. Until then a real airship was impossible. In this respect the airship resembles the aeroplane, which also has depended for its development on the internal combustion engine.

The earliest efforts to produce a lighter-than-air vessel that could be kept under effective control while in the air were made in France by Santos-Dumont, but the greatest success attended the inventive efforts of Count Zeppelin, the famous German engineer who planned and built giant airships at Friedrichshafen, on Lake Constance in Southern Germany. During the war zeppelins proved so valuable that other nations followed the example of Germany and built similar vessels; but in the meantime the aeroplane made such great strides that the more expensive airship was to a large extent neglected.

In Great Britain the airship has had a chequered career. In 1919 came the famous trans-Atlantic voyage of "*R.34*." This airship succeeded in crossing the Atlantic in both directions, thus gaining for Great Britain the honour of having made the first direct flight between Europe and America by airship. The time taken on the outward trip was 108 hours, while the return journey was made in 75 hours. The Atlantic was not crossed again in this manner until five years later, when the German airship "*ZR3*" made the journey by a more southerly route than that adopted by the British vessel.

Faith in the airship was shaken by the disasters that overtook "*R.38*" in this country, the "*Shenandoah*" in America, and the "*Dixmude*," a French airship that was destroyed during a storm while flying over the Mediterranean. Recently it has been restored by the successful flights of the "*Graf Zeppelin*." The exploits of this vessel have aroused the greatest interest, and have once more drawn attention to the undoubted advantages possessed by airships. She has crossed the Atlantic no fewer than five times, and also has carried out a still longer flight, in the course of which she travelled right round the world in four "hops."

It is of interest to recall that the "*Graf Zeppelin*" holds the record for the quickest journey round the world. Until her great voyage this had been held by two Americans, who had circled the earth by boat and aeroplane, chiefly the latter, in 23 days. The "*Graf Zeppelin*" reduced this to 21, of which only 12 were spent in actual flying, the airship remaining moored at her stopping places during the remaining nine days of this historic voyage.



Rear view of "*R.100*" when approaching completion, showing the lower rudder and one of the side fins

The success of the "*Graf Zeppelin*" has shown that the airship may become a reliable means of comfortable air travel. It is gratifying, therefore, to know that Great Britain intends to keep in the forefront of progress in this regard, and for some time two giant airships, each larger than the "*Graf Zeppelin*," have been under construction in this country. These are "*R.100*," constructed by the Airship Guarantee Company Ltd. at Howden, and "*R.101*," which the Government have built at Cardington.

These giant airships have been constructed on similar lines, the chief difference between them being that "*R.101*" is fitted with experimental Diesel oil engines, while the motive power of "*R.100*" is derived from engines using ordinary petrol. It was originally intended that "*R.100*" also should use engines of this type, but unfortunately developments have not proceeded as rapidly as was expected, and light Diesel oil engines giving sufficient power were not available. Unforeseen difficulties have arisen in the construction of both airships, as is natural with vessels of an experimental character, and these have delayed progress.

From a technical point of view both "*R.100*" and "*R.101*" must be regarded as pioneer airships, and it has already been suggested that still larger and more powerful vessels should be built for the purpose of making regular flights between Great Britain and America. These have already been given the name of "*Atlantic*" airships, and their design will be based on the performances of "*R.100*" and "*R.101*." These vessels therefore will be closely watched during flight in order to detect weak points. It is believed that the experience gained in this manner will enable airships to be constructed with sufficient lifting power and speed to carry large numbers of passengers and a useful cargo across the Atlantic Ocean at comparatively small cost.

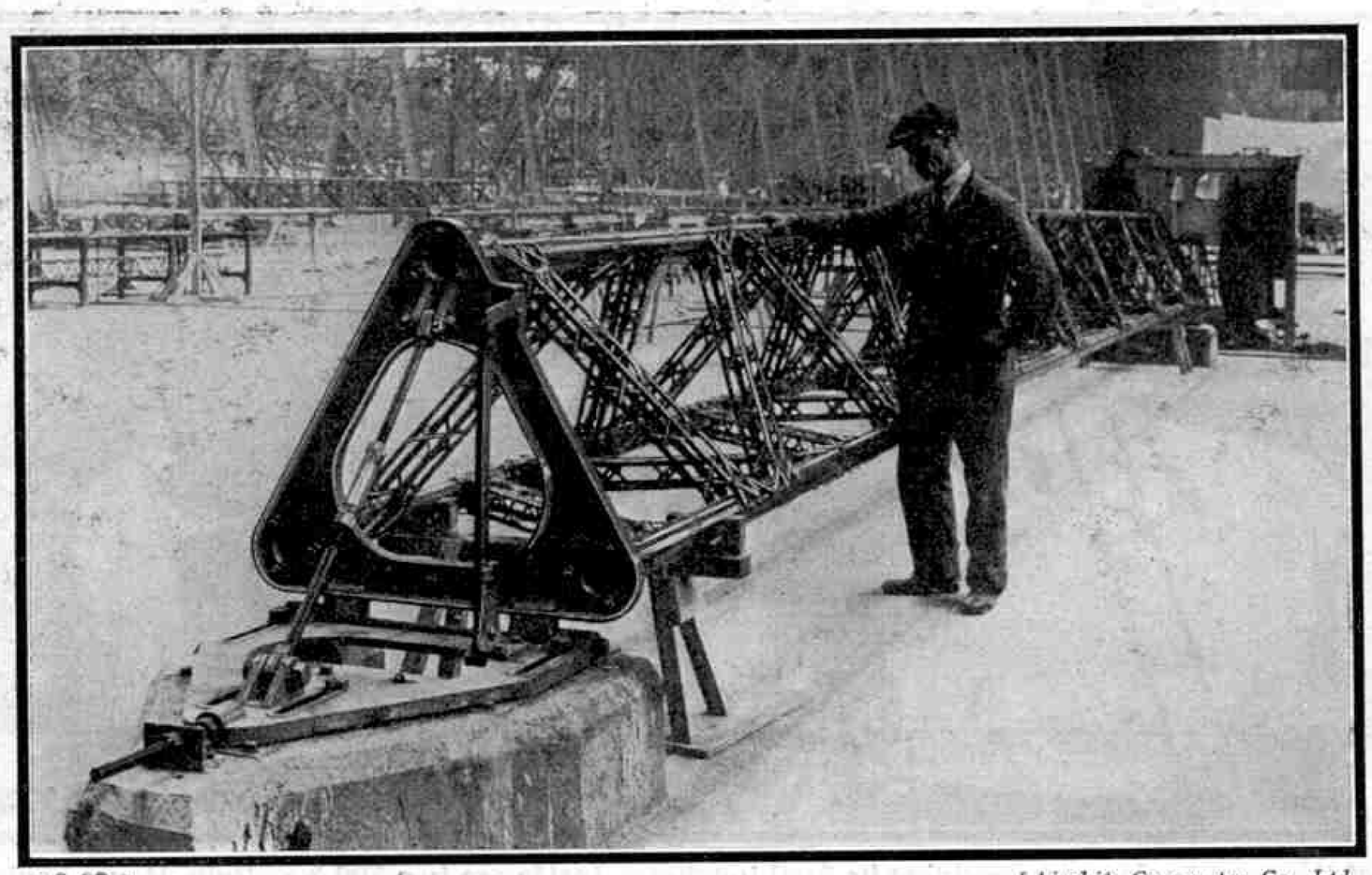
From every point of view the completion of these wonderful vessels is a very important event, and a description of them is of outstanding interest. Since the vessels differ chiefly in regard to motive power it will be sufficient to describe one of them only, and we propose to deal with "*R.100*," as her engines present no unusual features.

The first thing that strikes the visitor to Howden is the size of the shed in which the airship has been built, but on entering it is realised that the hangar had to be enormous, for the vessel herself is of stupendous size. To begin with, she is 709 ft. in length. If she were stood on end alongside the Great Pyramid this would

be completely dwarfed, for the silvery envelope would overtop it by nearly half its length! Even the famous Woolworth Building, the highest in the world, is less than 100 ft. higher than the huge British airship is long.

A better idea of her magnitude may be obtained by comparison with the "*Mauretania*," the most famous of British-built giant liners. This vessel is 762 ft. in length, and is thus only 53 ft. longer than "*R.100*." A mere consideration of the length of the airship is scarcely sufficient to illustrate her enormous size, however, for the diameter of the envelope is no less than 133 ft. Thus the vessel is nearly twice as wide as the "*Mauretania*," and is considerably wider than the "*Majestic*," the largest ship in the world.

Before the gas bags were installed in their framework of girders, the future airship presented a wonderful spectacle. The frame of the vessel is rigid, and is built up from 16 triangular girders that run the entire length of the vessel. Each of these girders is 2 ft. 3 in. in depth, and in common with other metallic parts of the vessel they are made of the very light alloy called duralumin. They are equally spaced around the envelope of the ship, and are rigidly held together by means of a series of cross girders, the whole making a perfect maze. At this stage of its construction the huge airship bore considerable resemblance to a giant Meccano model!



Courtesy] [*Airship Guarantee Co. Ltd.*

A section of one of the 16 triangular girders that form the basis of the structure. They are constructed from duralumin and run from nose to tail of the airship

Inside the framework are the gas bags. The large amount of gas required by an airship of this size is not carried in one compartment, for greater safety results from the use of a series of cells or separate gas bags. One or more of these may be damaged and the gas in them may escape without involving the vessel in serious disaster.

A rigid airship has the great advantage over a semi-rigid airship or an ordinary balloon, that the strain is on the framework, and is not carried by the envelope itself. For this reason the gas bags may be made of lighter material. In "*R.100*" they are made of a light fabric that is covered with "goldbeater's skin" and varnished.

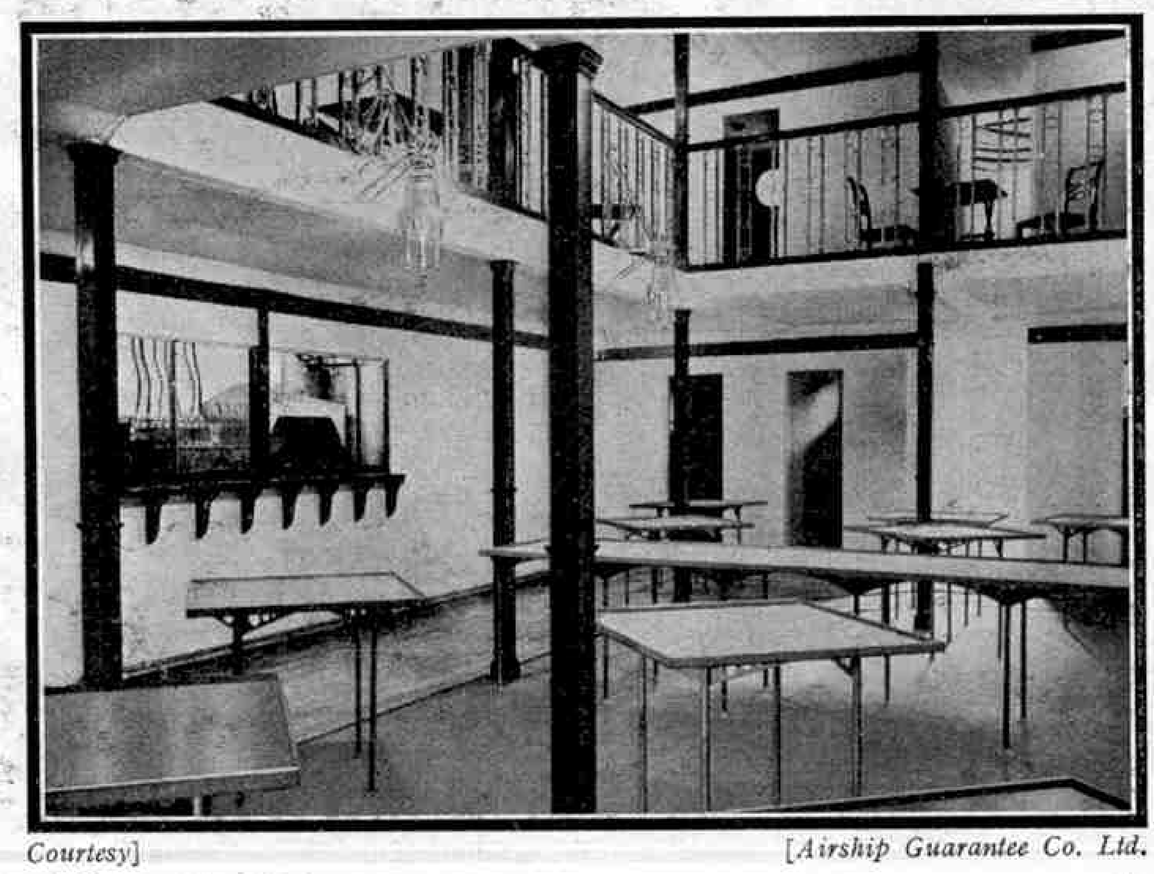
The purpose of the goldbeater's skin is to make the cells as gas-tight as possible. The material is obtained from very tough sections of the intestines of cattle, and its name is due to its use during the middle ages by goldsmiths, who reduced sheets of gold to leaf of an almost incredible thinness by placing them between strips of the skin and hammering them for days. It is strong and light, and is prepared for use in the manufacture of airships by salting, washing and preserving in glycerine. Each skin is from 15 in. to 30 in. in length, and about 6 in. in width, and the task of cementing the million or so required in position is long and tedious.

It is when we consider the lifting power of the gas with which the cells of "*R.100*" and of other airships are filled that we realise why these vessels must be so large. The gas bags of "*R.100*" are filled with hydrogen, the lightest of all known gases. Although this gas is much lighter than air, yet a hydrogen balloon with a capacity of 1,000 c. ft. is only able to lift a dead weight of 70 lbs. The new airship has a total capacity of 5,000,000 c. ft., which seems enormous, but her lifting power is only 156 tons. This means that in spite of her size she has a useful lift of only 64 tons, for the vessel herself weighs 92 tons. The vessel is fitted with sleeping berths for 100 passengers and carries a crew of 40, and when provision has been made for their accommodation the total weight that may be allotted to cargo is reduced to eight tons.

The airship is driven by six Rolls-Royce petrol engines, carried in three cars slung from the hull. These are rated at 4,200 h.p. and are capable of giving the vessel a speed of 80 miles per hour. Her normal cruising speed will be 71.5 miles per hour, and at this speed she will be able to carry sufficient fuel and stores to give her a range of 3,500 miles with full load. The tanks in which the fuel is carried have a capacity of 30 tons. They are placed inside the cover and from them pipe lines carry the petrol to the cars in which the engines are carried.

The general arrangement of "*R.100*" may best be understood by making an imaginary journey from one end to the other. At the bow of the vessel are the fittings by means of which it may be secured to a mooring mast, and there is also an observation station with windows for the use of the crew while this delicate task is being carried out or when on look-out duty.

From this station the visitor passes to an enclosed corridor for the use of passengers. It is electrically lit and leads to the passenger coach, which is about 180 ft. from the bow. The accommodation for passengers is remarkably roomy and their quarters may almost be described as a three-storey building that is slung inside the hull of the ship. It is surrounded entirely by a double wall in order to prevent inflammable gas or vapour from penetrating into the living quarters.



Courtesy] [*Airship Guarantee Co. Ltd.*

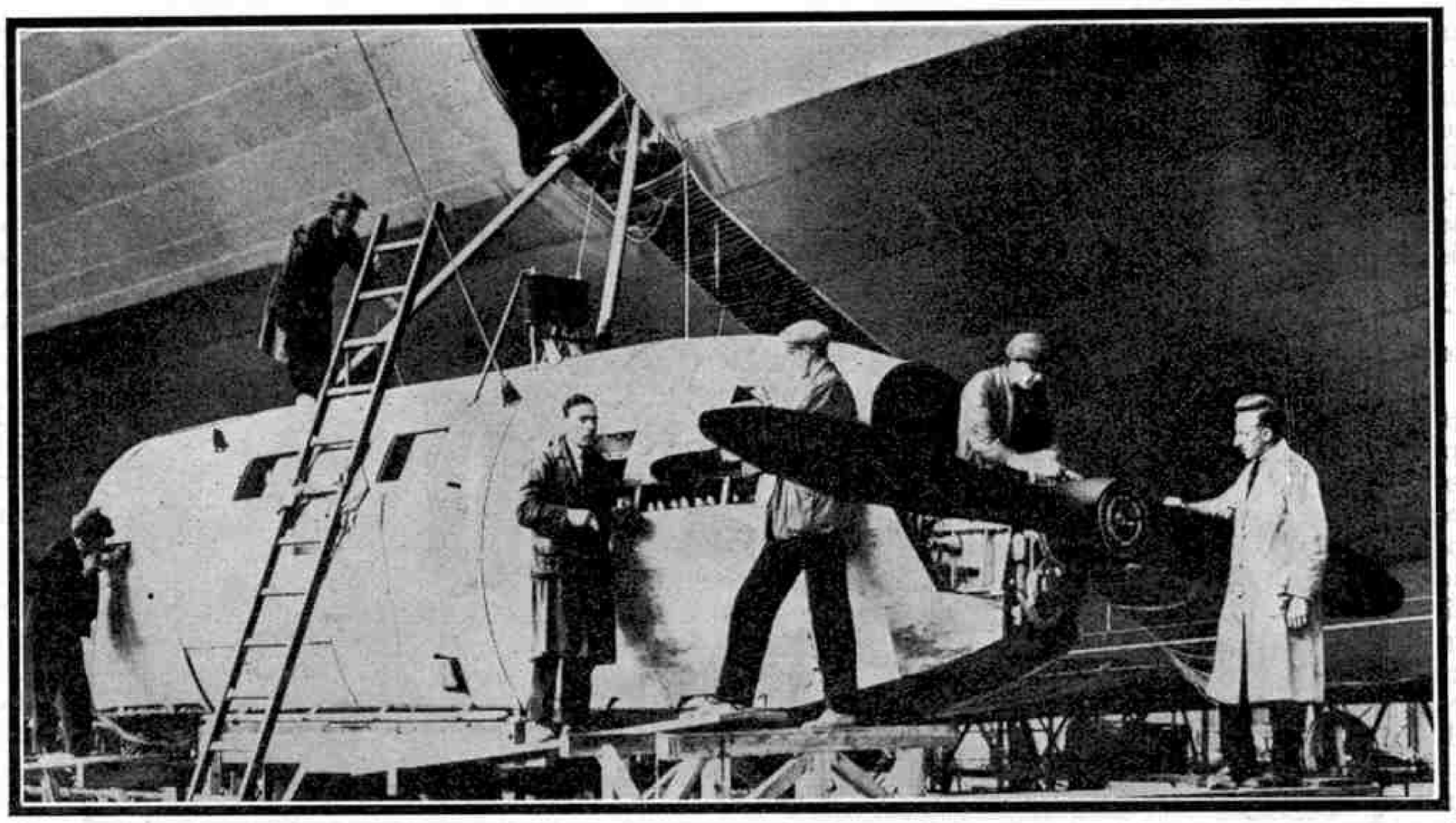
The dining room of the giant airship. Outside are spacious promenades for the 100 passengers who can be accommodated

The two upper floors are reserved for the use of passengers. They have been designed to give a fair degree of comfort and are unexpectedly luxurious in appearance. The passengers are quartered in two- and four-berth cabins similar to those found on ocean-going liners, and windows in the sides of the ships provide light and give passengers a view of the land or sea over which the vessel is passing. The dining saloon is a surprisingly spacious compartment, and there are also balconies or promenades of sufficient size to enable passengers to indulge in dancing. The accommodation is certainly far superior to that of any aeroplane, and has been described as intermediate in comfort between that of a Pullman train and an ocean liner.

The lowest floor of the passenger coach is allocated to the crew, and below it is slung the control car, which projects from the bottom of the hull of the vessel. It is from this car that the ship is driven and steered, and in it are grouped the navigation instruments. These are similar to those of an aeroplane, with the addition of statoscopes, which tell the pilot whether the ship is

rising or falling, and manometers by means of which he may gauge the pressure in the gas bags.

Aft of the passenger coach the corridor becomes narrower and less attractive, for here it is meant for the use of the crew only. Passing along it for a distance of 130 ft. brings the visitor to two engine cars suspended outside the hull, one on each side. Each car contains two 700 h.p. Rolls-Royce engines, together with a smaller petrol engine, the purpose of which is to drive the dynamo that generates the current necessary for lighting, heating, cooking and wireless. Nearer the stern is a third engine car also equipped with two 700 h.p. engines. All three cars are so far removed from the passengers' quarters that the noise and vibration due to the engines is practically unnoticed.

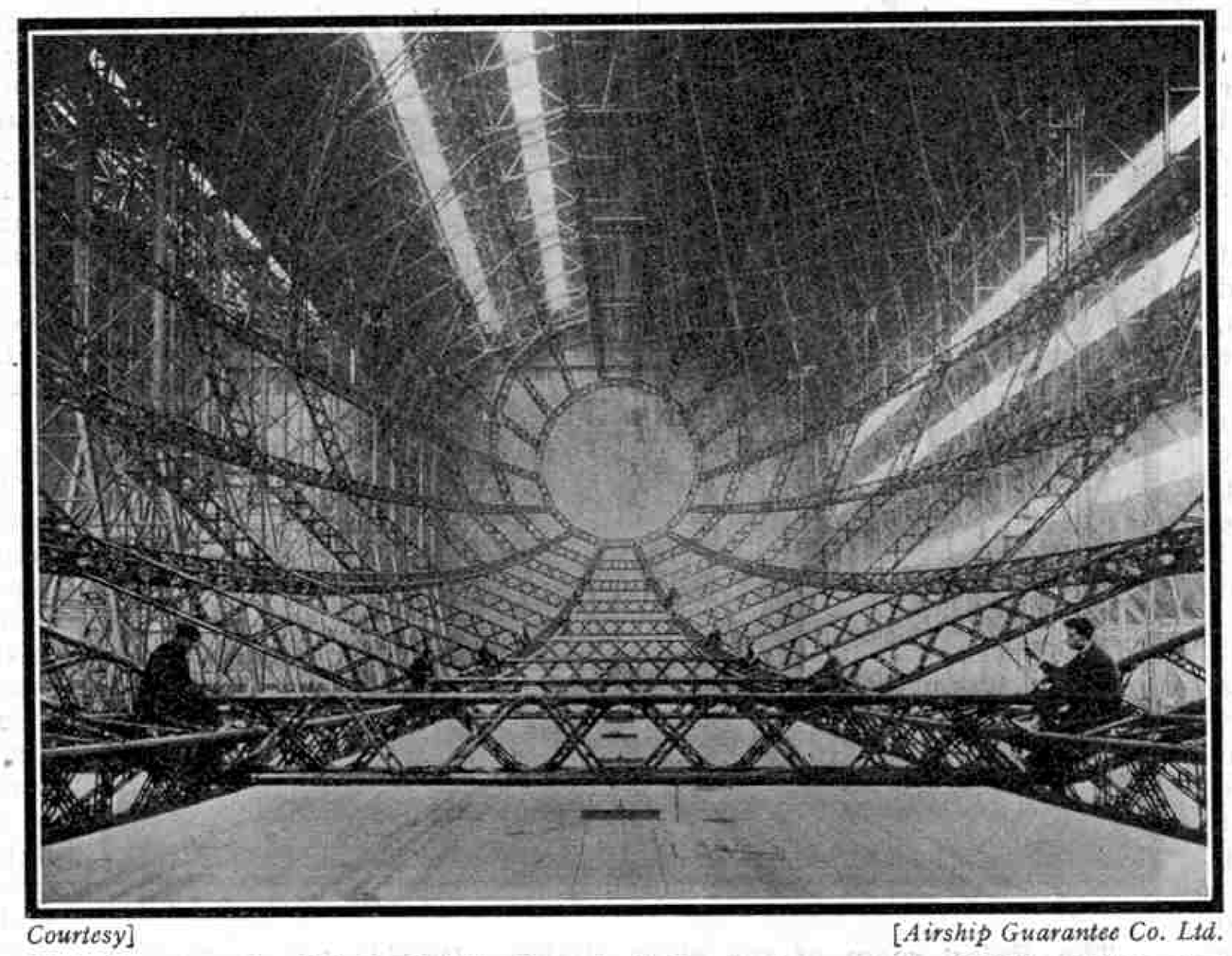


One of the huge engine cars receiving its final touches. Inside are two 700 h.p. Rolls-Royce engines

Immediately after passing the third engine car the fins and rudders are encountered. These act like the feathers on an arrow to ensure stability in flying, in addition to enabling changes of direction or of elevation to be made. The main corridor of the airship comes to an end 90 ft. from her finely-pointed tail. This is in marked contrast to her nose, which is blunt and rounded.

Handling a vessel of the size of *"R.100"* is not an easy task. Except in a storm there is little difficulty when she is in the air, trouble arising chiefly in bringing her to the ground and in entering or leaving the shed. Then manœuvring a large airship, a vessel that is naturally fragile, in a strong wind, or indeed in a wind above 10 miles per hour, calls for a considerable amount of experience, skill and man power.

The future of the airship largely depends on finding a successful solution to landing problems. A large ocean-going steamer such as the *"Mauretania"* is taken into dock with the aid of tugs and steam winches. If she could make her way through the dock gates only under her own power it would be necessary for her to wait outside until the weather was favourable, and even then the task of bringing her safely into her final position would be extremely delicate and full of danger. At present airships about to land are handled without any appliances corresponding to tugs and winches, and in order to realise how unsatisfactory this is, we may try to imagine how difficult it would be to bring the *"Mauretania"* into dock with no external assistance beyond that of gangs of men pulling on ropes. For this reason, the Airship Guarantee Co. Ltd. have developed the use of winches and other gear in order that *"R.100"* and smaller airships may be handled more easily and safely than at present.



Courtesy] [*Airship Guarantee Co. Ltd.*

Main framework of "*R.100.*" Our photograph gives a splendid idea of the size of the airship, and of the magnitude of the shed at Howden in which it has been built

When in actual service an airship seldom enters a shed, the only occasion when this is judged necessary being when she is due for overhaul or special repairs. Instead, at the end of a journey she is "anchored" to a mooring mast that in appearance is not unlike a lighthouse. It is about 200 ft. in height, and the bow of an airship is attached to it in such a manner that the ship may swing round in the wind exactly as a boat at anchor swings to the tide.

To bring an airship to anchor at her mooring mast is very much easier than taking her into the shed. On arrival at the aerodrome a cable is dropped from the ship, and this is linked to a similar cable laid out upon the ground from the masthead. Then the vessel is slowly and steadily hauled in until she can be moored, her own buoyancy, of course, keeping her floating in the air.

When an airship has been moored it is easy to take in stores and to disembark or embark passengers. A covered gangway connects the top of the mast with a door in the nose of the ship and through this outgoing passengers make their way to the lift shaft that runs up and down the mast. Ordinary stores are brought in through this doorway, while fuel and, if necessary, more gas are readily taken in through pipe lines.

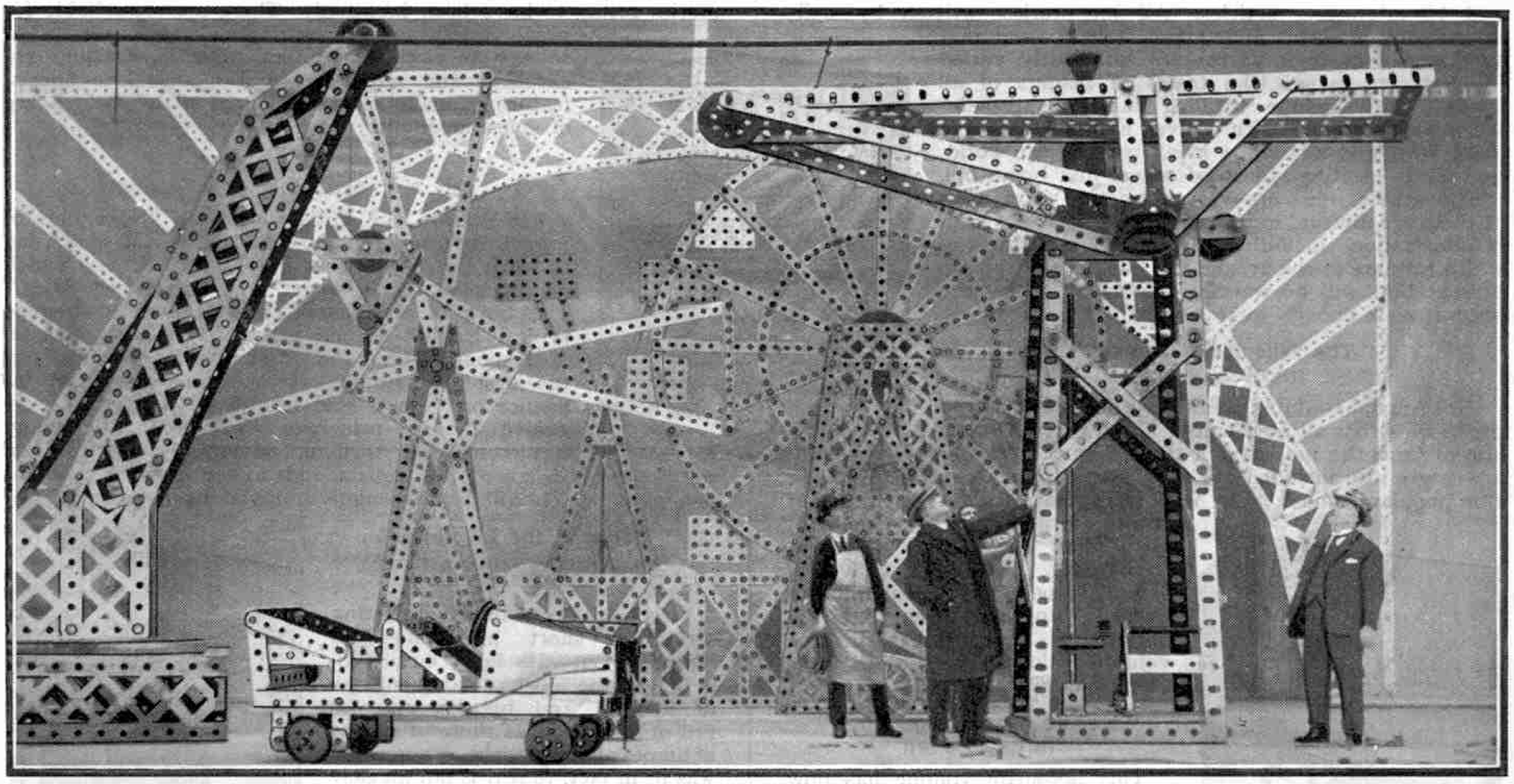
It is interesting to consider the performance that is expected from *"R.100."* Although her range at full load is given as 3,500 miles, the safe operating range after making full allowance for head winds may be taken as 2,500 miles. The voyage of 5,000 miles to India should be made in two stages, therefore, each occupying 36 hours. An intermediate stop in Egypt of 12 hours would be sufficient for refuelling, and thus *"R.100"* should bring India within 4 days of England. Similarly Canada will be brought within 3 days and only 8 days will be required for the journey to Australia. It is on these imperial routes that *"R.100"* will first be employed.

Although *"R.100"* appeared likely to be completed first, *"R.101"* was the first to be launched into the air. This event took place on 12th October last, the giant airship being walked out of her shed at Cardington by a ground party of no fewer than 400 men and secured in position at the mooring tower. Later the vessel made successful experimental flights on which her behaviour was fully in accordance with expectations.

The chief difference between the two airships is in the machinery employed to turn the propellers. The five engines of *"R.101"* are Beardmore *"Tornados."* These use heavy oil fuel instead of petrol. They have added to the weight of the vessel and thus have reduced her speed and carrying capacity.

Meccanoland at Drury Lane

Models 20 ft. high Worked by Real Meccano Boys



MECCANOLAND is a wonderful place! Just when we have finished reading *"Adventures in Meccanoland"*—where Dick dreams of his Meccano models shrinking to miniatures—we learn that there will be giant Meccano models in London this Christmas! Whoever imagined Meccano models 20 ft. in height? Yet huge Meccano cranes and bridges, and Meccano motor cars—big enough to hold real people—will be included in the spectacular Meccanoland scene in "The Sleeping Beauty" at Drury Lane.

In this wonderful Julian Wylie pantomime we shall follow handsome Prince Florizel in his numerous adventures that end happily in the awakening of the Sleeping Beauty. At one stage in the unfolding of this story, the audience will find themselves in Meccanoland, and we can imagine the gasps of astonishment and delight with which Meccano boys (and girls!) will greet this wonderful scene. In it the whole stage at the Theatre Royal will be filled with huge Meccano models, it being Mr. Wylie's idea to show a land where everything is constructed from Meccano. In the background will be a great arch bridge spanning the stage and forming a glittering framework for the whole. Model builders will recognise many old friends, such as the Pit Head Gear, Dutch Windmill, Flip Flap, Hammerhead Crane, etc.

The delights of the scene do not end with the models themselves, for the stage will be occupied by Meccano boys—wearing the regulation jersey—and chorus, the members of which will wear hats crowned by miniature working Meccano models of all kinds. Anxious to help Prince Florizel in his efforts to release the Sleeping Beauty from the Turret Chamber of the Witch's Tower, they show that they possess the practical commonsense of all Meccano boys by relying on their Meccano to get them out of a difficulty. They build a wonderful Aeroplane in which the Prince flies off to the rescue, scatters the demons who obstruct his path, scales the walls of the Tower, and completely defeats the witch! All Meccano boys will rejoice in the part played by their hobby in the downfall of the villain. By no other means could the Prince secure so quickly a machine in which to make the flight to the Tower, and in fact, if it were not for Meccano the release of the "Sleeping Beauty" would be extremely difficult if not altogether impossible!

Our illustration shows giant Meccano models in the process of construction. We hope every reader who lives in or near London will be able to see these models in the "Sleeping Beauty" Pantomime at Drury Lane, this Christmas. Further details in this article.

The models that will be on view in the wonderful Meccanoland scene are built on such a gigantic scale that, at first sight, it seems almost as though the parts come from an Outfit belonging to the children of the Giants that Gulliver encountered in one of his famous voyages! Strips, Girders, Plates, and other Meccano parts are reproduced eight times the size of ordinary parts. From them the models that appear in the scene are constructed in the regulation manner with the aid of giant nuts and bolts. Every model works perfectly and to sit in front of the stage and see these gigantic creations in motion will be an experience long to be remembered. How the workmen who planned and built these models must have enjoyed their task. Making the parts for this wonderful stage scene must have reminded them of the days when they, too, were Meccano boys and built models of the same type!

There is another difference between the "Engineering in Miniature" of Meccano model-building and the make-believe engineering of the Drury Lane pantomime. As everyone knows, Meccano parts are made of stout steel and the box containing each Outfit has a comfortably weighty feel. If steel parts were used in building the gigantic models for Drury Lane's representation of Meccanoland, the huge Angle Girders and Flanged Plates could only be lifted with the aid of a powerful crane! For this reason, wood is used in making the large scale models, but notwithstanding this they have been constructed with as much care as is given to the making of real Meccano parts.

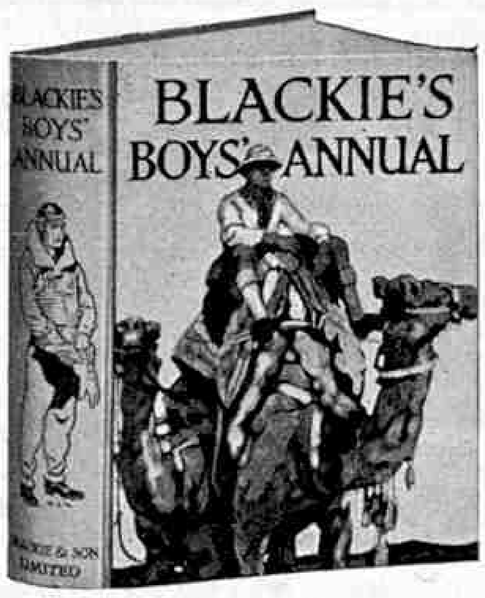
When the Meccanoland scene is "on," the scene will be one of bewildering beauty, enhanced by the art of the theatre electricians working "behind." The immense switchboard at Drury Lane is fitted with every conceivable mechanism to enable any desired effect to be obtained. The lighting can be varied with startling rapidity, and during this scene the men behind the scenes will flood the stage with most wonderful lighting effects. The entire pantomime is planned on a magnificent scale and the gorgeous scene in Meccanoland is one that should not be missed by any Meccano boy who may have the chance of visiting Drury Lane.

New Books for Christmas

"Blackie's Boys' Annual"
(Blackie & Sons Ltd. 5/- net)

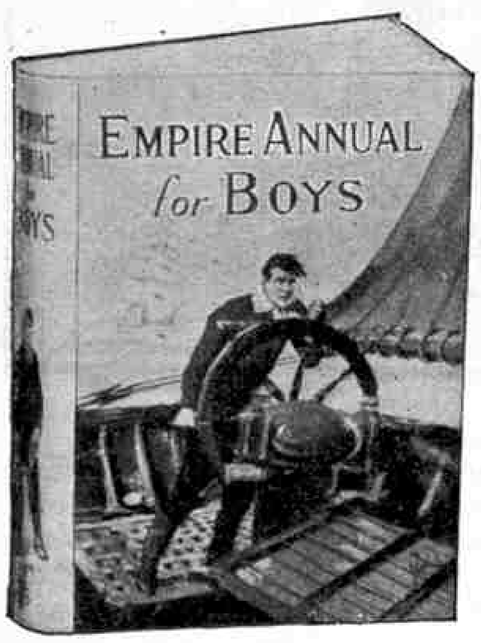
This attractive book contains 28 stories of medium length and 10 interesting articles. All the stories—written by well-known authors who understand how to maintain the interest of their yarns—are sufficiently varied in character to suit the tastes of readers of all types. They include thrilling tales of struggles with pirates, fights with wolves and bears in the Wild West and adventure in all parts of the world, as well as exciting stories of school and home life.

The articles also are very attractive, and most of them are unusual in character. There is a wealth of illustration, including 10 full page plates, of which four are in colour, and the book is a Christmas present that will be warmly greeted by those who are fortunate enough to receive it.



"The Schoolboys' Annual"
(R.T.S. 3/6 net)

This Annual contains a number of excellent stories of the type that all boys enjoy. Well-written school stories form the majority of these, but the tales of adventure also included are fully up to the standard expected in this popular Annual. An interesting feature is the inclusion of short informative articles on subjects that often bring enquiries from boys. The excellent illustrations in tone and colour include several humorous ones and the variety of good things in the volume make it a very acceptable Christmas gift.

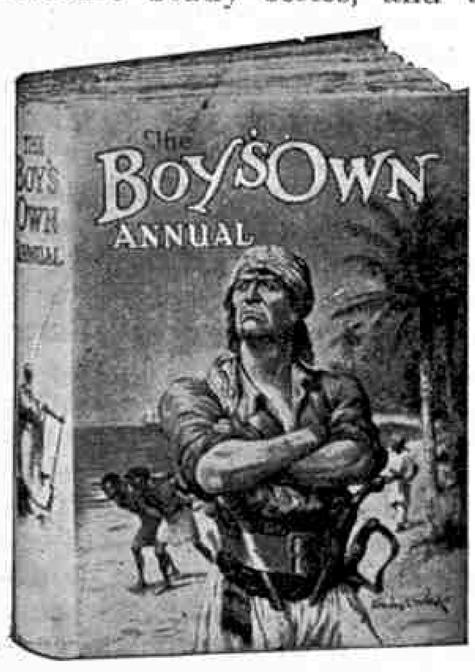


"Empire Annual for Boys"
(R.T.S. 7/6 net)

This favourite volume has now reached its majority, and the 21st volume is one of the best yet published. It contains no fewer than 31 splendid tales of adventure, school-life, sport, and discovery, and the boy who does not enjoy them must be very difficult indeed to please. A large number of illustrations add to the attractions of the volume, and the coloured plates are particularly excellent.

"The Boy's Own Annual"
(R.T.S. 12/6 net)

The 51st volume of this old friend is as fresh and interesting as any of its predecessors have been and contains the usual excellent selection of lively stories and general articles. The latter deal with practically every hobby in which boys are interested, and include useful contributions of the "How to Make" variety. Other interesting articles include a splendid Nature Study series, and the Stamp Section and other regular features are quite up to their usual standard.



The serial stories are of splendid quality and have not been made ridiculous and impossible in the effort to introduce thrills. They include the usual yarns of school life and adventure. Of these may be mentioned "The Vultures of Desolate Island" a thrilling story of the air, and "The Liberators," a splendid story of adventure in the South Seas in which readers of past volumes will meet old friends who can be relied upon to give them an exciting time of a novel kind.

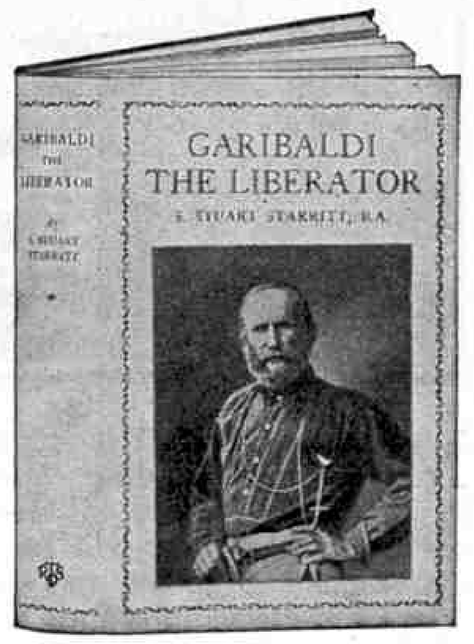
In comparison with previous issues the number of shorter stories seems to have been increased. These are remarkable for great variety and are sure to make a strong appeal to a wide circle of readers. The illustrations are excellent and numerous, and as usual, a special feature is made of the coloured plates, which are of splendid quality.

We can supply any of the books mentioned on these pages. Orders should be addressed to the Book Dept., Meccano Ltd., Old Swan, Liverpool. The sum of 1/- should be added to the published price of the book to cover cost of postage. Any balance remaining will be refunded when the book is sent, as postages vary according to the weight and destination.

"L.B.W."
By R. L. Bellamy. (R.T.S. 2/6 net)

L.B.W. are the initial letters of the names of Lionel Bertram Williams, and it is not surprising to learn that at Derling Preparatory School, which he attended, their owner was known as "Leg." The boys of the school were trained to become typical English Public School Boys with a sense of responsibility. The discipline was severe but the system certainly exercised a wholesome influence on "Leg" and his friends, and they were guided by its principles throughout the many humorous and thrilling adventures described in the book. A coloured frontispiece adds to the attractions of this fine yarn, which will be thoroughly enjoyed by its readers.

"Garibaldi the Liberator"
By S. Stuart Starritt, B.A.
(R.T.S. 2/6 net)



This book is one of an interesting series of short biographies of famous men. Its hero, Garibaldi, is one of the most romantic figures in history, and his life was as full of adventure as those of dozens of heroes of story books. So crowded was it, in fact, that it is not an easy task to write a short account of the exploits of the great Italian patriot. Mr. Starritt has been decidedly successful, however. His story is simply but attractively told, and to those who are looking for something different from the ordinary story book, this account of the life of the simple-minded Italian hero may be recommended.

"Twenty-Six Viking Stories"
By John D. Stuart. (R.T.S. 3/6 net)

Ever since the days when the Norsemen and Danes crossed the North Sea in their long ships to ravage the coasts of Western Europe, the stories of their amazing exploits have thrilled boys in all countries. The Vikings spent their days in fighting and their evenings in feasting, and themselves were stirred up to perform great exploits by the examples of the warrior gods who figured in the legends, sung and recited by the Saga men.

In this book Mr. Stewart has collected the best of the stories that have been handed down to us, both of the mythical gods and heroes and of the great Vikings of history. There is plenty of fighting in the book—in fact, one of the twenty-six stories tells of a battle that never ends—and in them also is the humour and cunning usually found in folk tales. The stories are splendidly told in modern language, and the value of the book is increased by four splendid full page illustrations and a very striking frontispiece in colour.

"The Secret of Tuff's Tower"

By A. L. Haydon
(Fredk. Warne & Co. Ltd. 2/- net)

Tuff's Tower had been built by a retired sailor with a taste for astronomy. The locals believed that old Tuff himself had been a pirate, and it is certain that he constantly received visits from many queer sea-faring men. These often ended in quarrels, and after one of them old Tuff disappeared, but his ghost appeared to haunt the Tower and to guard the pirate's hoard supposed to be hidden in it.

The lost treasure was not the real mystery of the Tower, however, for the story of Tuff's ghost was cleverly used to hide the actual secret. It would be unfair to explain how this was disclosed as the result of creditable detective work on the part of Phil and Ken Charteris, schoolboys at the neighbouring Harrowcliffe College; and all boys who enjoy a well-written story should read the book itself in order to follow the exciting chain of events that ended in the destruction of the Tower.

"Captain Starlight"

By Percy F. Westerman. (Blackie & Sons Ltd. 3/6 net)

In his mysterious airship "*Black Comet II*," Captain Starlight leads his readers into adventures that will satisfy their wildest dreams. The Captain is the owner and inventor of this amazing vessel, the engines of which derive their power from the wireless waves sent out by broadcasting stations. Among the members of his crew are a number of boy scouts, who have been specially selected as likely to prove resourceful in emergency, and with their assistance Captain Starlight rescues the crew of the first "*Black Comet*," which had been torn from its moorings and wrecked over a deserted island in the Pacific Ocean.

Rescue operations are complicated by the efforts of a foreign spy either to discover the secret of the mysterious airship or to destroy it. In spite of all difficulties the lost men are found and taken on board the airship, and the story ends with the destruction of a rival airship and the death of the master spy, who is on board.

An adventure with cannibals; the rescue of the inhabitants of an island overwhelmed by a volcanic eruption; and a hairbreadth escape from disaster in a violent storm help to maintain interest throughout this thrilling story. The book is excellently illustrated and will hold its readers from start to finish.

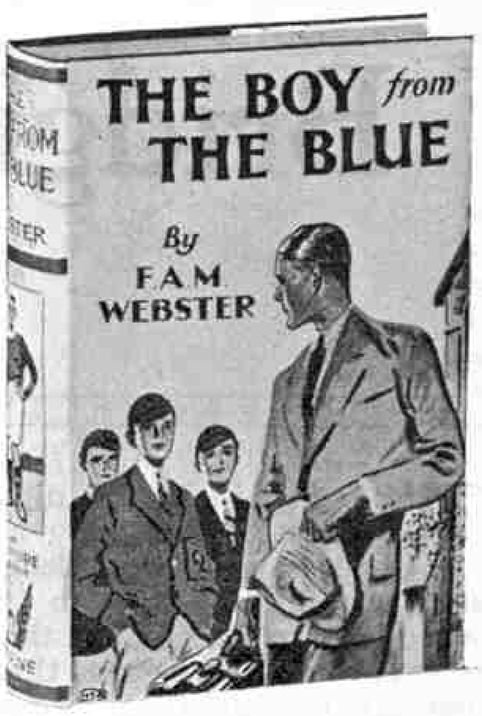
"300 Things a Bright Boy Can Do." By Harold Armitage
"301 Things a Bright Girl Can Do." By Jean Stewart

(Sampson, Low, Marston & Co. Ltd. Each 6/- net)

These companion volumes are large books that contain an astonishing variety of information on topics in which boys and girls are most interested. Undoubtedly both are excellent value, for they are not books that will be read and lightly thrown aside, but will be referred to time and again in order to settle points that continually arise in the lives of active boys and girls in search of new interests and hobbies.

In its 534 pages the first of the two books covers an extraordinary range of subjects from athletics and outdoor games to keeping rabbits and guinea pigs. Every possible outdoor sport and recreation appears to be dealt with in simple but adequate fashion, and it is interesting to find that in this section of the book are included chapters on model yachts, camping, angling, and gardening. Then follow chapters on party amusements, including ventriloquism and conjuring, and winter evening games, puzzles and riddles. In themselves these would make a valuable book, but the author continues with interesting accounts of modern scientific marvels, which are illustrated by means of simple experiments that may easily be performed by readers. The chapter on pets is full of valuable advice, and not the least interesting sections of the book are those in which the author deals with "Odds and Ends" and what he describes as "Jobs for a Rainy Day."

The companion volume for bright girls contains one more "thing" than a bright boy is told how to do, possibly because it was impossible to decide which one to leave out. The general lines of the book follow that of Mr. Armitage's volume. The author caters for girls of every type, and deals skilfully and sensibly with the special requirements of the modern outdoor girl.



"The Boy from the Blue"

By F. A. M. Webster. (Fredk. Warne & Co. Ltd. 3/6 net)

This is a school story of a somewhat unusual but attractive kind. The hero—"The Boy From The Blue"—is Jim Dawson, the son of a famous East African hunter. Jim himself is perfectly at home in the wilds, and in spite of his youth, during the Great War he took a man's part in the fighting in German East Africa. The discovery of a gold mine results in Jim being sent to England, where he enters a large public school.

In his new surroundings Jim at first feels very strange, but his native shrewdness enables him to overcome the difficulties with which he is faced, and in this process he is greatly helped by the athletic ability natural to one who has spent so much time in strenuous outdoor pursuits. He becomes Captain of the school, and at the end of the story he makes a rapid journey to his former home in order to save his father from ruin at the hands of a scoundrel.

The book is very well written and in the sports scenes it is easy to detect the hand of the expert. The account of Jim's struggles on the track and in the field events to give his House the victory in the Annual School Sports is one of the best things of the kind we have read.

"Up the Rock"

By David Ker. (W. & R. Chambers Ltd. 3/6 net)

The scene of this story is set in Spain during the struggle by British and Allied forces under Lord Peterborough to drive out the French Prince, Philip, who had become king of that country. Peterborough carried on the war with a mere handful of men, but by a series of amazing exploits he very nearly toppled the French Prince off the throne. He assaulted fortresses with cavalry; with meagre forces surprised and routed large armies; and on one stormy night he rashly put out to sea in a small boat in order to search for the British fleet, and narrowly escaped drowning.

In his amazing adventures Peterborough is followed by Percy Ashe, the hero of this story, who proves to be a fit companion even for such an erratic genius as his leader. The dangers braved in this manner are insufficient for the hero, who finally sets off with a Spanish friend, to visit Madrid, then in possession of the followers of Philip, in order to rescue his friend's sister. On this perilous journey the travellers are attacked by wolves, fall into the hands of brigands, and narrowly escape being shot as spies on the accusation of a renegade, but the resources of our hero pull them through every dangerous situation. He personates a distant cousin in the French army, and in this guise is even presented to King Philip! Finally he and his friend carry off the girl, a troop of advancing British cavalry providentially coming to their rescue when the chase is at its hottest.

Every boy who is lucky enough to become the possessor of a copy of Mr. Ker's book will enjoy the feast of adventure in this well-told story.

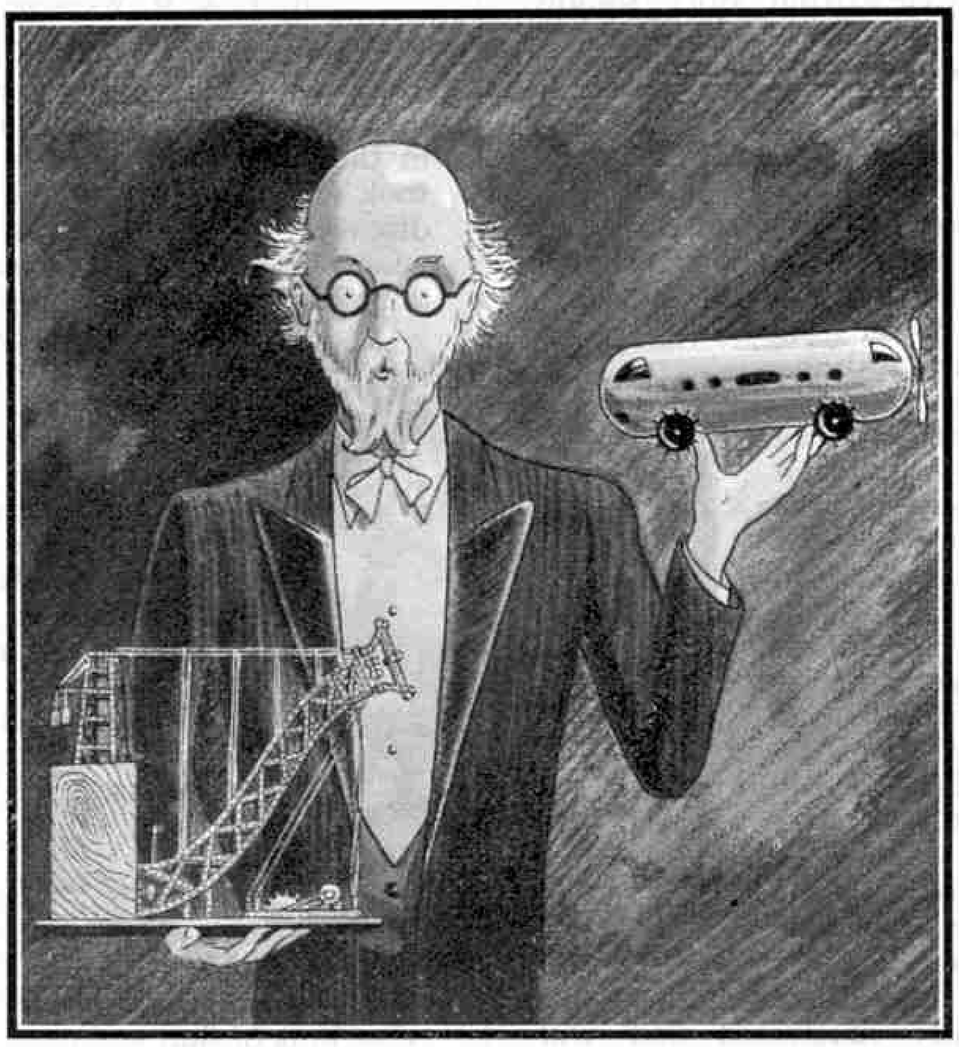
Bridging the English Channel

Famous Scientist's Amazing Scheme

By Our Special Correspondent: Frank Ellison

THE story of scientific discovery and invention is of enthralling interest to everybody, and it is only natural that all Meccano boys take a great delight in reading the lives of the great men who have helped to build up civilisation. Although it is wonderful to learn how these men achieved their successes, it is even more so when there is the added privilege of being associated with them throughout their careers. Actually to see inventors at work in their laboratories; to talk with them over their plans; and to follow the stages by which they overcome difficulty after difficulty—that indeed is an unforgettable experience! It was with such wonderful thoughts as these in my mind, and three fountain pens and six pencils in my pocket, that I arrived at Dozieville, a little village near Dover. Here it is that Professor Barmidotti, the world-famed scientist, has established his headquarters.

I had last seen the worthy Professor when I attended the sensational lecture in which he described the elaborate plans he had made for a journey by rocket to the Moon. A full report of this amazing scheme—the latest effort of post-war science—together with further details of the proposed flight, was given in the "*M.M.*" for January, 1928, to which interested readers will please refer. Since that time nothing had been heard of the learned Professor's activities, and as the Christmas number of the "*M.M.*" was going to press, the Editor asked me to undertake a special mission to enquire when the venerable scientist's plans were likely to be put into operation. Of course, a journey to the Moon is no light undertaking, but we all felt that some explanation of the delay was necessary—if the Professor was not to be classed as one of those preposterous imposters who at various times impose upon an unsuspecting public by claiming that they have solved the problem of journeying to other worlds by other than natural means.



The latest portrait of Professor Barmidotti. Britain's greatest genius is showing—with commendable and touching pride—models of two of the most striking of his many wonderful inventions

After a long walk from Dozieville station I reached the Professor's house and was ushered into his laboratory by one of his assistants. Owing to the subdued light I could at first see nothing but retorts, batteries, wires, and formidable-looking pieces of apparatus of all descriptions. When my eyes became accustomed to the gloom, however, I descried the learned Professor bending over a metal pan on a specially designed stand in the furthest corner of the room. The whole attention of the great man was concentrated on his work. Naturally I hesitated to interrupt the world's foremost scientist—who was I, I thought, that I should intrude myself on an experimenter who was devoting his whole life to science . . . . . to the benefit of the great cause of humanity . . . . . to uplifting the human race from the depths of despair to the heights of ecstasy? But remembering that I represented the "*M.M.*" and that I was, in fact, the chosen emissary of 100,000 of the finest boys in the world, I pulled myself together, and taking my courage in both hands, I coughed once . . . . . twice and . . . . . thrice. But without effect, for as is usual with all keen scientists, the world's greatest savant was completely absorbed in his work and was watching the contents of the metal pan so intently that he was totally unaware of my presence.

Obviously, any repetition of the expression of laryngital irritation of my epiglottis would be unavailing no matter how prolonged, so I gently tapped him on the shoulder. The howl of pain and the ejaculation of words in what was apparently a foreign tongue that followed, made me imagine for a moment that as the possessor of such an effective tap I should surely qualify for the world's heavyweight championship. But a slight smell of burning made me realise that the Professor's exclamation must be due to another cause.

When he had recovered his sangfroid, as our French readers would say, the Professor courteously explained that he was flooding a couple of sausages with ultra-violet rays in order to increase their vitamin content, before sending them to be cooked for his frugal meal. My tap on the shoulder had so startled him that accidentally he had placed his hand on the terminals of the mercury arc lamp that he was using to produce the violet rays, and had thus received a very purple shock. Being on the lookout for ideas myself, I decided that if ever I were called upon to tackle Phil Scott or Primo Carnera, I would arrange somehow to conceal a mercury arc lamp in each glove!

When I had made myself known, Professor Barmidotti welcomed me with great enthusiasm. He is himself an old Meccano boy, it appears, being the proud owner of a complete 00 Outfit that he has built up by degrees from a beautiful No. 7 owned by his younger son!

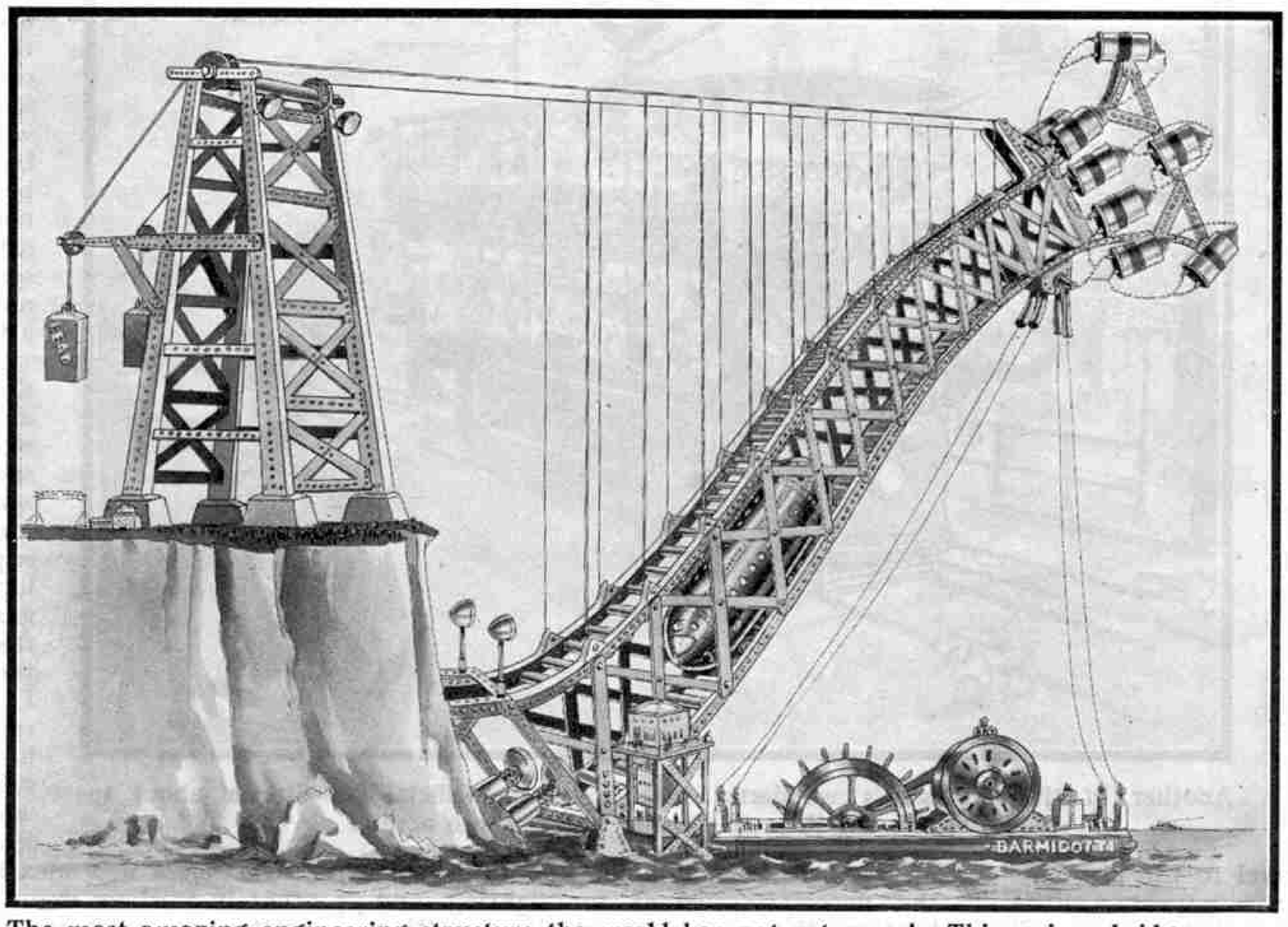
I explained that the purpose of my visit was to enquire if any further progress had been made with the great scheme for visiting the Moon. Our readers particularly wanted to know, I said, if the full description of the Professor's amazing rocket published in the "*M.M.*" had resulted in any wealthy syndicate of financial magnates coming to his support. To my amazement I learned that the Professor had not been approached by a single individual, but in spite of this fact he was not disheartened. He is quite aware that men of genius usually are left to struggle alone and even to starve for lack of appreciation. He confided in me that he had determined to raise the necessary sum himself by means of a number of simpler inventions easily understood and generally useful. The first of these inventions certainly has been very successful, and promises to bring him a considerable sum of money. It is a wonderful self-starting tramcar and has already been adopted by the Tramways Department of the progressive town of Slushton, and without doubt will make an early appearance in other towns and cities at some remote date.

The principle of the invention is so surprisingly simple that I kick myself for not having thought of it myself. A wireless circuit including 15 or more valves is fitted to each car, and waves of a selected wave-length are broadcast from a central station. When the car is empty the circuit is not in tune with these waves, but when a body having large capacity is brought near the apparatus it receives them in full strength. In practice, this extra capacity is provided by the entrance of the passengers, matters being so arranged that when the car is full the capacity thus added is sufficient to bring the circuit exactly into tune, thereby causing it to operate a relay that starts the tramcar.

Thanks to the Professor's wonderful invention, in future every tramcar will carry a full paying load. The economy in running costs will be enormous—so great, indeed, as to be well worth off-setting against any irritation caused to those who at slack times will be compelled to sit for long periods while waiting for the car to fill up. The Professor is now at work devising subsidiary inventions covering special means of pacifying irate

passengers. It has already been suggested by the Professor that gramophone reproductions of his University Extension lectures on "Dry Dust and Hot Air in the Palaeolithic-Ooglical Epoch" should be used for this purpose. It is believed that passengers will become so absorbed in listening to this discourse that they will forget the flight of time. Meantime, the Corporation have arranged to provide each tramcar with six sets of "Snakes and Ladders" boards and packs of "Happy Families" cards. Prizes will be offered from time to time in connection with these games, and the winner of the greatest number during Civic Week will qualify for admittance without fee in the first round of the West of England Ludo championship held every ten years.

In explaining his invention to me the Professor observed that occasionally a little complication must inevitably occur. For instance, the last person may be under average size, in which case the capacity added may be insufficient to start the car. To meet this emergency it is necessary to arrange to station permanently at each terminus a man weighing about 20 stone who carries the title of Official Car Starter. How the O.C.S. performs his important duties is clearly shown in the accompanying illustration, which shows one of the cars of the Slushton Corporation Tramways about to leave an outlying terminus.



The most amazing engineering structure the world has not yet seen! This unique bridge across the English Channel has been designed by Professor Barmidotti, the world-famed scientist. It combines the merits of the arch and suspension types and has no middle, for very excellent reasons that are fully explained in this exclusive article

The Professor informed me that the man on duty at this point has never failed to start a car, and that usually even a look from him is sufficient to galvanise the most obstinate vehicle into instant activity.

Whilst I was admiring this delightful photograph, the Professor was rummaging through several cabinets. Eventually he found the object of his search in his pocket, however, and this turned out to be a sheet of paper that, when unfolded, was about 15 ft. square. On it was a drawing of a mechanism or structure of which I could make nothing. This, of course, was not surprising, for naturally the products of such a genius as Professor Barmidotti are only comprehensible to ordinary individuals after prolonged study—and not always then!

As I gazed at the wonderful drawing, I seemed intuitively to sense that it represented some resemblance to a portion of an arch bridge—similar, perhaps, to the massive structure now being erected across Sydney Harbour. I decided, however, that if the drawing really was of a bridge, then it certainly was the queerest structure ever seen, for it appeared to be a combination of a suspension bridge and arch bridge. Heavy cables hung from the arch, and appeared to connect it with a curious structure that floated on the water under the bridge. Girders, struts, and ties were planned to stretch in every direction, and I was particularly impressed by the enormous size of the arch itself. The small portion of this that appeared on the drawing seemed huge enough to accommodate an airship as large as "*R.101*."

In despair of ever being intelligent enough to understand the full purpose of the wonderful structure represented, I turned to the Professor and confessed that his work was entirely beyond me. Only then did he condescend to give me any explanation of his amazing scheme.

"This is a drawing of one end of a bridge to cross the English Channel," he said. "Naturally such a bridge must be stronger and larger than any yet built, and in planning it I have decided to combine the merits of all known types. It has always seemed rather futile to confine the design of any bridge to any particular type. Why should we always have Arch Bridges, Suspension Bridges, or Girder Bridges only? Why not extract all that is best in each design and combine them into one glorious whole? Do you follow me?"

I said I did and thus reassured the Professor proceeded: "As you will see from the drawing, the structure is an arch bridge, but in order that it may carry heavy loads, the arch will be suspended from cables in exactly the same manner as the deck of a suspension bridge is suspended The whole thing is so perfectly simple that even a child can understand it."

"But surely," I interrupted, "it will be necessary to carry to an enormous height the towers from which the cables are suspended?"

With a pitying smile, the Professor told me that he had understood that from the beginning, and in order to secure the necessary height he proposed to make use of the cliffs et Dover. "The anormous towers that are necessary for every suspension bridge will be constructed at the top of the cliff and will be no less than 1,200 ft. in height. Thus, the top of each tower will be at a height of 1,550 ft. above the surface of the water of the Straits of Dover, for the cliffs themselves thereabouts are 350 ft. in height, and thus are suitable for my purpose."

I rapidly calculated that if this plan were followed, the centre of the bridge would be nearly 11 miles from shore, and judging from the angle at which it rose upward from the ground, the arch would reach the tremendous height of about 4½ miles. I began to think that either the Professor had misplaced a couple of decimal points or that unwearying study had at last turned his brain, for it was obvious that towers reaching only to a height of 1,550 ft. above the water would not be of much use for suspending an arch 4½ miles in height!

With fear in my mind of a terrible tragedy, I asked the great man if he thought that the towers on the cliffs would be sufficiently high to suspend the middle of the bridge. He looked at me in wonderment and then asked what I meant by the "middle of the bridge." Patiently I explained to him that the arch he had drawn apparently would rise to a height of 4½ miles, and that I did not understand how he expected cables from towers little more than a quarter of a mile in height to support it at this point. At last he grasped the idea in my feeble mind and to my amazement burst into a hearty laugh!

"Good heavens! Are you so lacking in perception!" he exclaimed. "Don't you understand that the bridge I propose to build has no "middle"—in my opinion it is a sinful waste of material to construct more than a few yards at each end of a bridge. Besides, bridges with middles are exceedingly dangerous, as has been proved on many occasions in history. For instance, where did the Quebec Bridge break—it certainly was not near the shore. The first break came when the southern cantilever had been extended for some distance from the main pier, and the second collapse was due to defects in the central span. And the Tay Bridge, where did that collapse? Why—in the middle, of course!"

"But how on earth do you expect anyone to cross a bridge that is not there?" I asked, in bewilderment.

"You appear to have forgotten my rocket" he replied, in

a tone of severe reproof. He then proceeded to explain the wonderful project that he had thought out, and I saw what an ass I had been to have supposed even for a moment that a brain of my calibre could find a flaw in the Professor's plans. What I had taken to be the arch of the bridge is in reality a runway to accommodate a rocket! Actually, this will be a smaller edition of the amazing contrivance in which the Professor hopes to travel to the Moon. In the rear compartment will be carried a supply of explosives, adjusted to the exact amount necessary to carry the rocket across the Channel, where it will fall into a similar runway used subsequently for firing it in the reverse direction.

The chief modification in the design of the Channel rocket is that there will be a compartment for rockets at each end in order to avoid the necessity for reversing. The rocket used will be very roomy and comfortable in design, for of course, it will not be necessary on short trips to carry as many accessories as in the case of a rocket intended to travel to the Moon.

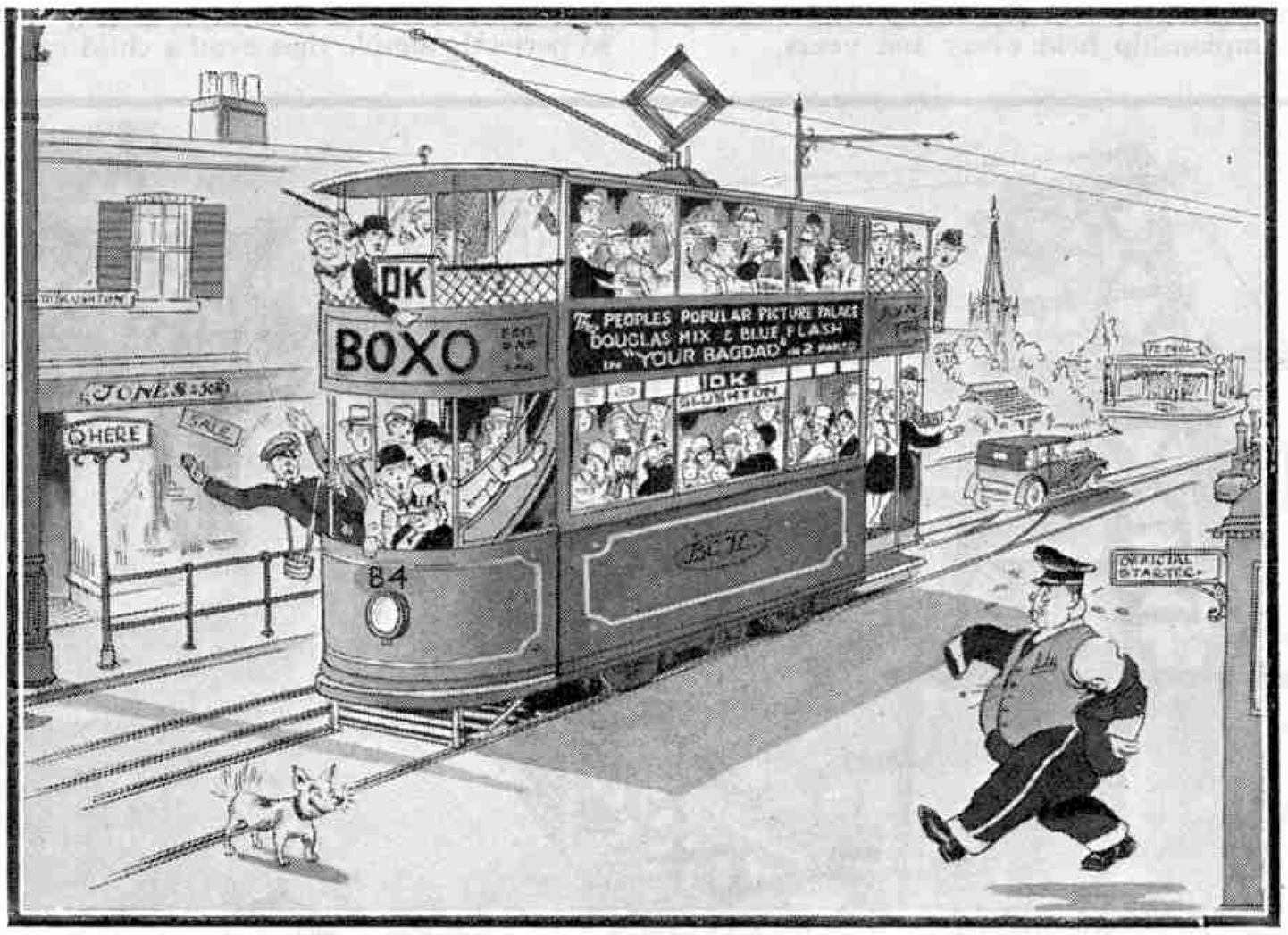
At first sight it may appear a little doubtful whether the rocket always will hit the runway on the portion of the arch erected on the further side of the channel. The Professor told me that he anticipated no difficulty on this score, however, for careful work on the part of the engineers who carry out his plans will enable them to place the two ends of the bridge exactly opposite each other. If the explosive charge is measured correctly it is thought that the rocket cannot fail to enter. In order to reassure timid people who may be unwilling to trust themselves to his guidance—there cannot be many, however, who do not place full confidence in him—he intends to widen out the ends of the arches into funnel-shaped openings in which a large number of powerful electro-magnets will be placed. In the unlikely event of any rocket deviating from its path, it will immediately be pulled into its correct position by the action of the magnets, and it must inevitably run down the arch and come to rest at the bottom.

It may be thought that the descent of a rocket will be extremely violent, and that on arrival at the bottom of the arch it will crash through the structure and demolish it. This cannot happen, however, for the retarding action of the magnets in the higher portion of the arch will reduce the speed of the projectile and hydraulic buffers eventually will bring it to rest.

The project is quite self-contained and nothing is forgotten. For instance, the power that will be required to produce the current for the electro magnets will be obtained from the rise and fall of the tides, and what I took to be cables descending from the bridge were really conducting wires from the floating power station established beneath. As the tide rises and falls it will operate turbines similar to those used in hydro-electric power stations and the current produced in generators connected with them will suffice not only to excite the coils of the electro-magnets, but also to provide the necessary current for lighting and heating the passenger station, waiting rooms, etc.

It is only a matter of time before this wonderful structure will make its appearance, for as soon as the Professor has made a fortune from his other inventions, he will begin with the construction of the cross-channel bridge, which will then provide funds for the Moon-rocket scheme. When the Channel Bridge is working, the visitor to the continent for the first time will be able to make use of an invention that combines the advantages of arch, suspension and transporter bridges with those of the rocket flying machines of the type that the Professor was the first to exploit. Sea-sickness will be completely avoided and nobody will have time to be airsick, for it must be clear to all our readers that the sensations of every passenger will certainly not last longer than a few seconds!

As I gazed in profound admiration at the drawing of the wonderful structure, I suddenly became aware that the Professor had ceased his explanations. Reluctantly tearing my gaze away from the fascinating plans of the Channel Bridge, I found that with a rapt expression on his face he was gazing through the window towards the French coast. I realised that a new idea had struck him and that in working it out he had totally forgotten my existence. I perceived that in my thirst for information I had taken up too much of the valuable time of Britain's greatest genius, and in awestruck silence I crept quietly from the room.



Another of the Professor's wonderful inventions—the Official Car Starter about to galvanise the self-starting tramcar into action

Famous Trains—(*Continued from page 915*)

Clapham Junction it becomes necessary to reduce speed. This point is little more than 104 miles from Bournemouth West, but we are due to pass it at 10.33, 113 min. after starting.

Through the maze of tracks of Clapham Junction we thread our way, and immediately after leaving the station itself we dive under the main line from Brighton. This joined us on our right immediately before reaching the station, and now climbs up to cross over on its way to Victoria. At this point there is an amazing area of tracks, and in all probability a greater number of parallel running lines, as distinct from sidings, exist here than anywhere else in Great Britain.

High speed over the busy stretch into Waterloo is impossible, and the immense volume of traffic makes very tight timing necessary. In order to fit in the expresses between the numerous electric trains entering the terminus it is necessary to use half-minute timings. For instance, at Vauxhall the booked passing time for the up "*Bournemouth Limited*" is 116½ minutes after leaving our starting point. When we reach Waterloo we have travelled 108 miles, and the manner in which our splendidly appointed train has made the journey over a road that is by no means easy, is highly creditable, even to our powerful locomotive and its capable crew.

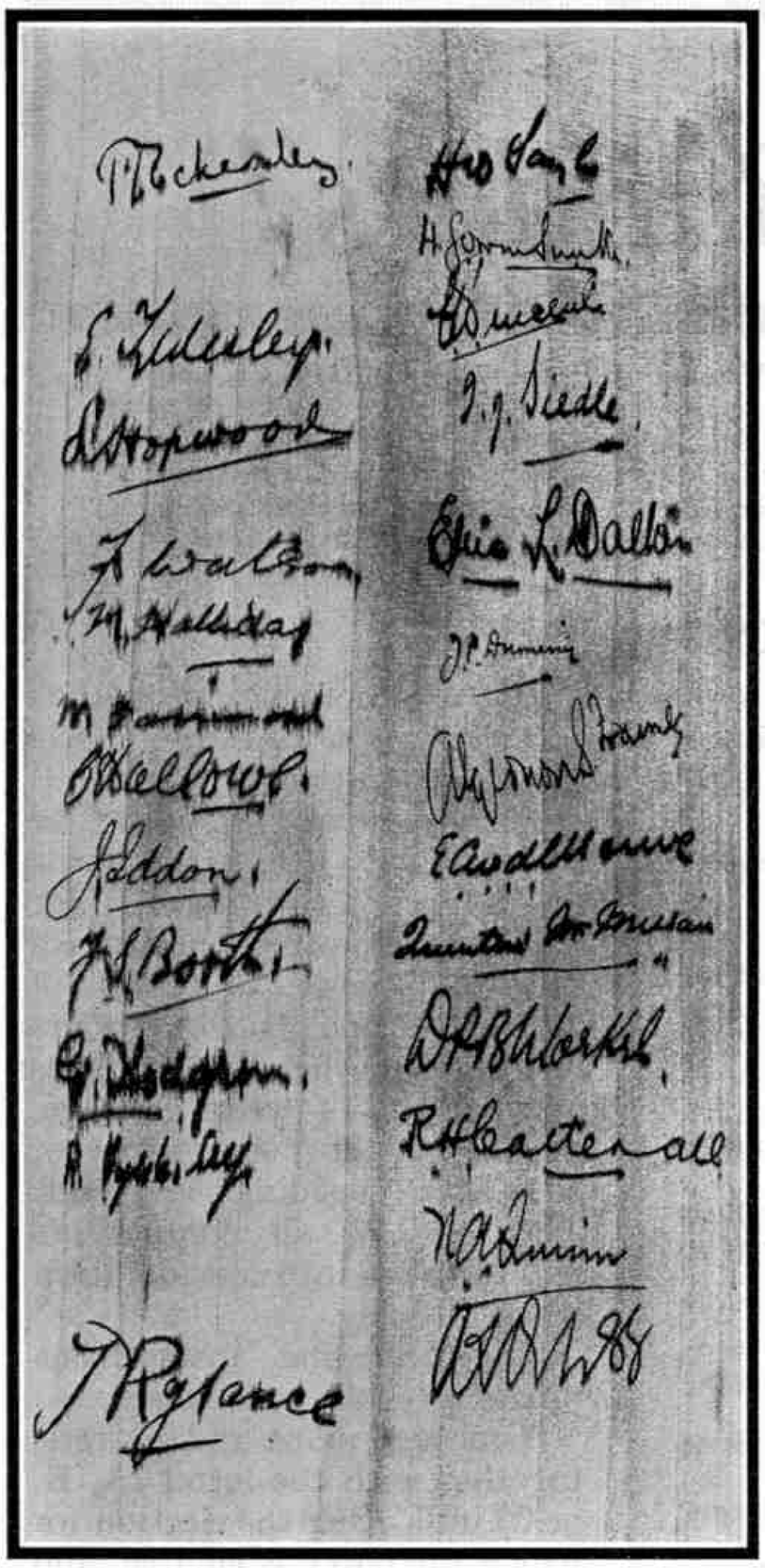
Puzzle Your Sharp-Eyed Friends—

(*Continued from page 937*)

inside the tube in the manner clearly shown in Fig. 12 on page 937.

While the conjurer is talking about being able to turn the bran into anything he likes he lets the lower glass, which is the one containing the bran, slip unnoticed out of the tube into the box of bran. It falls into the hollow in the bran and therefore makes no sound. The paper tube containing the other glass is then brought forward, and in due course the chocolate doll is revealed, when both glass and tube may be examined by anyone.

This trick is simple, but extremely effective. It will be seen that for its success it depends very largely on the ability of the conjuror to cover up his movements by means of patter, and this is a convenient point to emphasise the importance of being able to talk well. Those who wish to embark on the career of amateur conjurer should not only become acquainted with tricks such as those described in this article, but also must cultivate what may be described as a platform manner. This is by no means difficult, and it will be found that a little ready wit in conjunction with suitable patter for each experiment will help to carry a conjurer successfully through his performance, and in many cases to extricate him from unexpected difficulties.



Portion of the autographed bat to be awarded as prize in this competition.

The signatures of the members of the Lancashire County Cricket team are on the left and those of the South Africans on the right.

What Do You Know of Cricket?

WIN THIS SPLENDID AUTOGRAPHED BAT

In the special article in the October "*M.M.*" we described the visit of the South African cricketers to the Meccano factory in July last. We promised, too, that a splendid presentation bat, autographed by the members of the party and by the Lancashire XI against whom they played while in Liverpool, would be offered as the prize in a special competition to be held this month.

New readers will be interested to see the photograph of the autographed portion of the bat reproduced here.

Keen judges of the game consider the 1929 South African touring team as the greatest side that South Africa has ever sent to England. Their tussles in the test matches against the England XI were productive of some of the best fighting cricket ever seen in England, and Owen-Smith's century in the third game at Leeds will go down to history.

The prize bat is, then, an historic souvenir of a great side, and we may remark that only a few days ago a keen supporter of the Lancashire County XI offered the Editor a substantial sum if he would sell it. But the bat is intended for a Meccano boy, and we hope and believe that the lucky winner will treasure it and take care of it, for it is a bat to be preserved—not played with.

What you have to do to win the Bat

In the panel on the right of this page there appears a set of cricket questions and these competitors are invited to answer. Some relate to last season's play, some to historic matters, and others to matters that are purely controversial. All are straightforward questions, however, designed to test the competitors' general knowledge of the game. It will be noticed that most of the questions can be answered by a definite statement of known facts, but where the competitor is asked to give an opinion, he should state also, as briefly as possible, his reason for the opinion expressed and the grounds on which it is based.

Each question should be answered, but should any entrant find it impossible to answer all the questions he should not hesitate to submit an incomplete list. Competitors are not asked to rely on their own unaided efforts—they may enlist the assistance of parents, uncles and cousins. The main point is to try to win. Particular care should be taken in answering the final question, which is set deliberately to eliminate the possibility of a tie for the prize. There is, of course, nothing of which to be wary in the question; it is perfectly straightforward, and merely requires thinking over very carefully.

The autographed bat was specially selected for us by Mr. Jack Sharp, the ex-captain of the Lancashire County XI and one of the few athletes who have the distinction of having represented England both at cricket and football. The bat will be awarded to the competitor who submits the best set of answers to the test, and in making the award we shall ask Mr. Sharp to judge the answer to question 14, should the award finally depend on the answer to that question.

Meccano Products to the value of £1/1/– and 10/6 respectively will be awarded to the senders of the second and third-best efforts, and in addition there will be a number of consolation prizes consisting of pocket wallets, "Famous Trains" books and pocket books. As in all other "*M.M.*" contests the winners of the prizes consisting of Meccano Products will be allowed to choose their own prize from our catalogues.

Entries must be written on one side of the paper only, and the competitor's name and address must appear on each sheet of paper used. All entries must be addressed to "Cricket Test, Meccano Magazine, Binns Road, Liverpool."

To give our Overseas readers an opportunity to compete for the bat, the closing date for the competition has been fixed for Monday, 31st March, 1930, after which the judging will commence.

In the meantime, the bat, together with a photograph of the South African team, will be on view in the windows of prominent Meccano dealers, whose names will be announced in the "*M.M.*" each month.

1. (a) Where is the headquarters of Cricket?
(b) When was it founded?

2. What player has made the greatest number of centuries in first-class cricket?

3. What player first appeared for England as a bowler, going in last, and subsequently on merit, was chosen as an opening batsman?

4. Who was the most accurate bowler in first-class cricket last season? Give a reason for your answer.

5. Averaging play over a whole normal season, is the fast bowler more destructive than the slow bowler?

6. What is the closest win recorded in a first-class game?

7. What is the record individual first-class score?
(a) In any Country.
(b) In England.

8. Who holds the record for number of wickets taken in a test match series?

9. What player in a test match in England performed the hat trick in both innings?

10. What well-known cricketer had the mortification of seeing over 200 catches missed from his bowling in one season, and yet succeeded in taking over 200 wickets in the same season?

11. (a) Which county once provided the most destructive bowler, the most prolific batsman and most successful wicket keeper in the first-class records of one season?
(b) Who were the players?
(c) What were their records?

12. What player other than a wicket keeper has performed the feat of catching out ten men in an innings of a first-class county match?

13. Assuming you are Captain of a side containing only four really good reliable fielders, name the positions in which you would place them for your fast bowler, who bowls right arm, over the wicket, when he is bowling (a) for the off stump, (b) for the leg stump.

14. Who is of the greatest value to a side, a first-class bowler, a first-class wicket keeper, or a first-class batsman? (It may be assumed that the batsman is a moderate bowler and the wicket keeper and bowler are moderate bats).

During December the bat is on view as follows:—

3rd to 7th.	Henry Wiles Ltd., 124, Market Street, Manchester.
10th to 14th.	Pearson & Denham, 5, Bond Street, Leeds.
17th to 21st.	Rushworths Ltd., Westgate, Huddersfield.
24th to 28th.	Rushworths Ltd., Kirkgate, Bradford.
31st Dec. to 4th Jan.	Jenners Ltd., Princes Street, Edinburgh.

Prizes for
Meccano Model-Builders!

At this time of the year Meccano model-building activities reach their apex. Old Meccano boys are adding to their sets, and thousands of new recruits to Meccanoland are being enrolled, while Meccano Clubs are busier than ever arranging "Competition Nights" and exhibitions. Not every boy is fortunate enough to belong to a Meccano Club, however, and in order to ensure that every boy shall have plenty of opportunity to exercise his skill we are organising a grand Christmas Model-building Competition, in which models of all kinds may be entered, and three other interesting Contests that call for different kinds of model-building ability. We are confident that every Meccano boy will find at least one of these Contests particularly adapted to his favourite type of model-building.

GRAND "CHRISTMAS" MODEL-BUILDING CONTEST

IN this Competition we offer the splendid prizes listed in the accompanying panel for the best and most original models submitted. Think of something new and then set to work and build it neatly in Meccano. When the model is completed, take a photograph of it, or if this is not possible, make a neat sketch and send it along to Meccano Limited.

That is all there is to do. The Meccano Competition Department will do the rest and if you have taken pains with your model and put your best workmanship into it there is no reason why you should not wake up one morning to find a letter containing some good news awaiting you!

Any number of parts may be used in building the model. Do not be disheartened simply because you possess only a small Outfit; we are constantly reminding readers that a simple, well-built model stands a far greater chance of success than a badly designed and poorly constructed model, no matter how large and elaborate the latter may be. There are no entry forms to fill in and no fees to pay. All models submitted must be your own handiwork both in design and construction, although photographs or drawings need not be your own work. Actual models must not be submitted for consideration.

Eighty-Seven Prizes!

The Prizes to be awarded in Sections A and C of the Grand Christmas Contest are as follows:—

First Prize: Cheque for three guineas.
Second Prize: Cheque for two guineas.
Third Prize: Cheque for one guinea.
Six Prizes, each consisting of a real leather Presentation Pocket Wallet.
Twelve Prizes, each consisting of Meccano products to value 5/–. Twelve Prizes, each consisting of a Meccano Engineers' Pocket Book.

The Prizes in Section B are as follows:—

First Prize: Meccano products to value two guineas.
Second Prize: Meccano products to value one guinea.
Third Prize: Meccano products to value 10/6.
Six Prizes, each consisting of Meccano products to value 5/–.
Twelve Prizes each consisting of a Meccano Engineers' Pocket Book.
A limited number of Certificates of Merit will also be awarded in each section.

The competition will be divided into three Sections as follows:—Section A, for readers residing in the British Isles and over 14 years of age; Section B for readers residing in the British Isles and under 14 years of age. Section C for competitors of all ages residing overseas. The ages of all competitors will be taken into consideration when judging.

The following instructions must be followed closely:—

Your age, name and address, together with the letter (A, B, or C) indicating the Section for which the entry is eligible, and the name of the contest must be written clearly on the back of each photograph or drawing submitted. Address the envelope to "Christmas Model-building Contest," Meccano Ltd., Old Swan, Liverpool. Photographs of prize-winning models become the property of Meccano Limited.

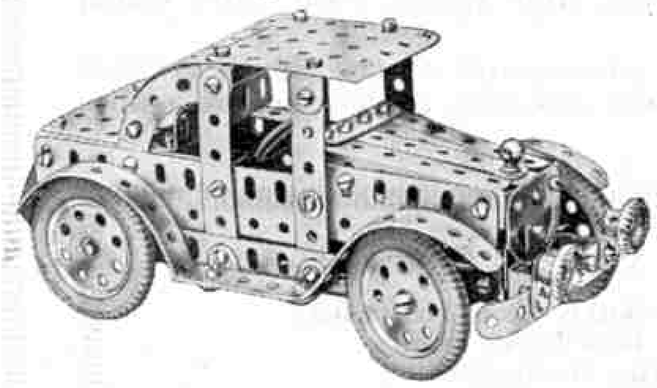
Closing dates, for Sections A and B, 31st January, 1930; Section C, 30th April, 1930.

A NOVEL "PARTS REQUIRED" COMPETITION

The splendid response to recent Meccano "problem" competitions encourages us to provide readers with yet another interesting test.

In entering the new contest, readers are invited to compile a complete list of the Meccano parts used in constructing the model two-seater motor car shown in the accompanying illustration. This contest, while providing a pleasant means of passing away an evening indoors, also affords a sure test of the competitor's knowledge of Meccano model-building.

There are no tricks in this competition; it is simply a matter of skill in estimating correctly the total parts embodied in the model. Some portions of the model cannot, of course, be seen in the illustration, and each competitor must calculate the list of parts by basing his estimation on the manner in which he personally thinks the model is built.



Can you make a list of the parts in this Model?

You are allowed one attempt only; but every reader, young and old, is eligible to compete in this novel competition. There are no entrance fees or forms required.

Entries will be divided into the following Sections: Section A, for readers residing in the British Isles; Section B, for readers residing Overseas. Closing dates, for Section A, 31st December, 1929; Section B, 31st March, 1930.

Prizes of Meccano or Hornby goods to the value of £1-1s., 15/–, and 10/6, will be awarded in each Section to the readers who send correct or nearest correct lists of parts. In addition, a "Meccano Engineers' Pocket Book" will be forwarded to each of the twelve competitors whose lists are next in order of merit.

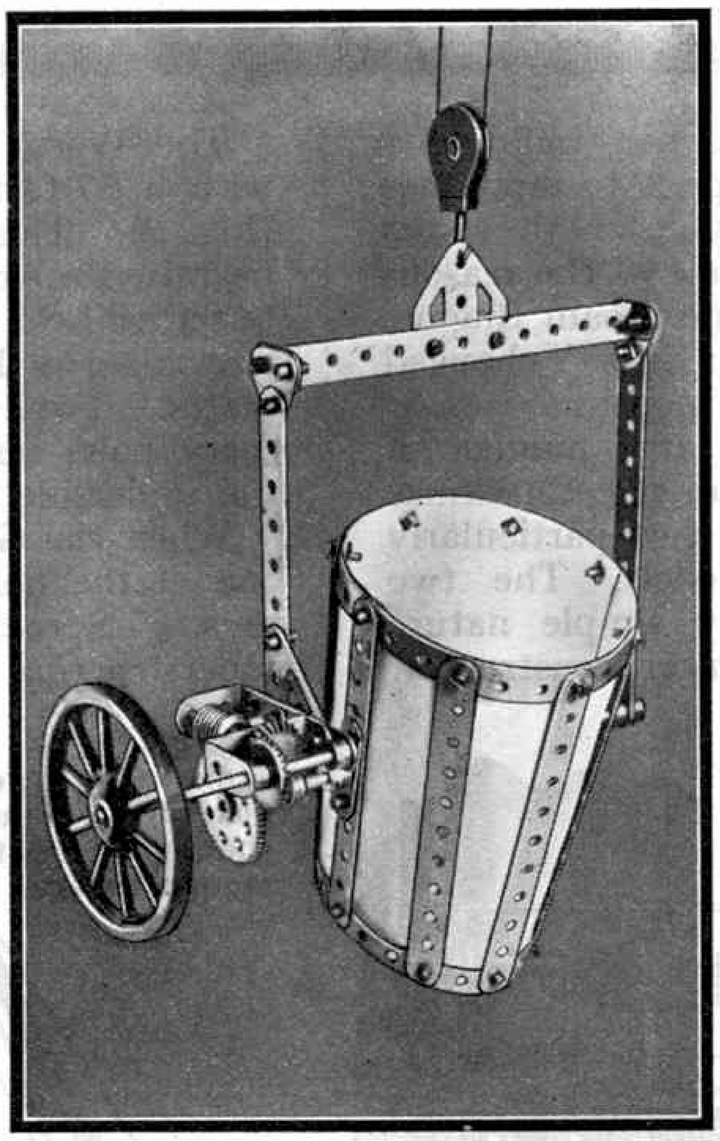
SECOND "SIMPLICITY" MODEL-BUILDING COMPETITION

Judging by the record number of entries received in all sections, the first "Simplicity" Model-building Competition must undoubtedly be placed amongst the most successful contests yet announced in the "*M.M.*" Since the results in the "Home" Sections were published we have received many letters asking us to organise a second "Simplicity" Competition, and as the Christmas holiday period affords a favourable opportunity for all Meccano boys to compete, we have decided to do so this month.

The rules of the contest are few and simple. There are no entrance fees to pay or forms to fill in. The contest is open to boys of all ages, residing in any part of the world.

The idea of the competition is "simplicity in model-building" and the title indicates the type of model that may be entered. In several previous model-building competitions many of the entries submitted have appeared unnecessarily intricate and could, in the majority of cases, have been built more efficiently with fewer and more simple parts; the purpose of this contest then, is to encourage Meccano-ites in devising realistic models, using as few parts as possible.

It must not be imagined, however, that in entering this Contest you are limited to any particular size of Outfit or number of parts. You may use just so many and varied parts that you wish, remembering that the prizes will go to the boys who construct the most ingenious models with the least possible number of parts. This contest offers a splendid opportunity to newcomers to Meccanoland, and to all those boys who have not entered previous model-building contests because they did not possess large Outfits. The owner of a No. 00 Outfit has just as much chance of success as the more fortunate possessor of a No. 6 or 7 Outfit.



A model foundry ladle constructed by E. H. Bradshaw, Sheffield, and awarded a prize in the First "Simplicity" Model-building Contest

Entries will be divided into three Sections: Section A, for competitors over 14 years of age residing in the British Isles: Section B, for those under 14 years residing in the British Isles: Section C, for readers of all ages residing Overseas.

Prizes will be awarded for the best entries from Sections A and C as follows: First, Meccano goods to value £2-2s.; Second, Meccano goods to value £1-1s.; Third Prize, Meccano goods to value 10/6. Six Prizes, consisting of bound copies of the Complete Instruction Manuals.

The awards in Section B are: First Prize, Meccano products to value £1-10s.; Second Prize, Meccano products to value 15/–; Third Prize, Meccano products to value 7/6. Six Prizes each consisting of a "Meccano Engineers' Pocket Book." Also a limited number of consolation prizes and Certificates of Merit will be given in each section.

When you have built your model you should take a photograph of it, or if this is not possible, prepare a good drawing and send it, together with any explanation you may think necessary, to "Second Simplicity" Model-building Contest, Meccano Ltd., Old Swan, Liverpool. Actual models must not be sent. Write your age, name, and address clearly on the back of each sheet of paper or photograph sent in, and state the Section in which the model is entered. Closing dates, for Sections A and B, 31st January, 1930; for Section C, 30th April, 1930.

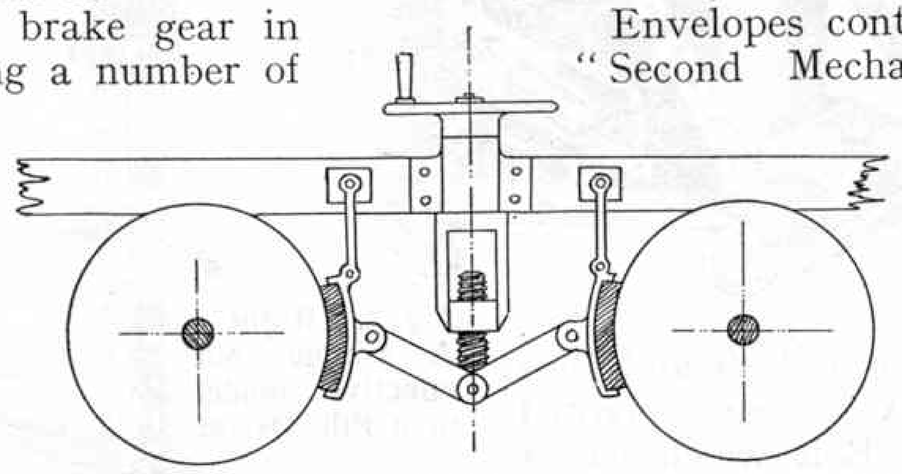
SECOND MECCANO "MECHANISM" COMPETITION

Among the many mechanisms employed in the construction of modern machinery are numerous forms of brake gear. A brake is an appliance for producing friction on a moving body, in order to reduce its speed and bring it to rest.

Most machines are fitted with some type of brake and readers will be familiar with the simple forms to be found on bicycles and motor cycles. For large and powerful machines, however, more elaborate apparatus is necessary, and many ingenious devices have been designed for use on locomotives, high speed racing cars, and other swiftly-moving vehicles.

In view of the importance of brake gear in modern engineering we are offering a number of handsome prizes for the best examples of brake gear designed by our readers.

It is not necessary to build a complete model. All that is required is just a section of a model embodying some form of brake apparatus. For example, a section might be built up on the lines of the accompanying illustration.



An example of Brake Gear suitable for use on trolley wagons and other slow moving vehicles

The drawing shows a type of brake gear suitable for wagons and other similar vehicles. On turning the handwheel, the screw, attached to the brakes by "toggles," moves in its nut and operates the brake shoes.

Actual models must not be sent. It is only necessary to submit either a clear photo or a good drawing. The competitor's age, name and address are to be written clearly on the back of all photos or drawings submitted.

Entries will be divided into two Sections; Section A, for readers of all ages residing in the British Isles. Section B, for readers of all ages residing overseas.

Envelopes containing entries are to be addressed "Second Mechanisms" Contest, Meccano Ltd., Old Swan, Liverpool. Closing dates: Section A, 31st December, 1929. Section B, 31st March, 1930.

The Prizes in each Section are as follows: First, Meccano products to value £1-1s.; Second, Meccano products to value 15/–; Third, Meccano products to value 10/6. Twelve Prizes, each consisting of a Meccano Engineers' Pocket Book.

New Meccano Models

Steam-Operated Swivelling Jib Crane — Two "No. 1" Models — Steam Paddle Boat

THE aim of every Meccano boy when building a model of an engineering prototype is to reproduce the original as closely as possible, both structurally and mechanically, and this is one of the reasons for the huge success of the new Meccano Steam Engine, hundreds of Meccano Engineers having "changed over to steam" during the last few months.

As there are sure to be a further large number of "converts" to steam as a result of the Christmas season, we are describing this month, two particularly fine examples of steam-operated models. The two other models included are of a very simple nature and will doubtless appeal to the younger constructor.

Fixed Radius Steam Jib Crane

The model crane shown in Fig. 1 incorporates three separate motions — hoisting, travelling, and slewing —each of which is driven from the Steam Engine crankshaft through one of the smallest three-motion gear boxes that it is possible to construct in Meccano!

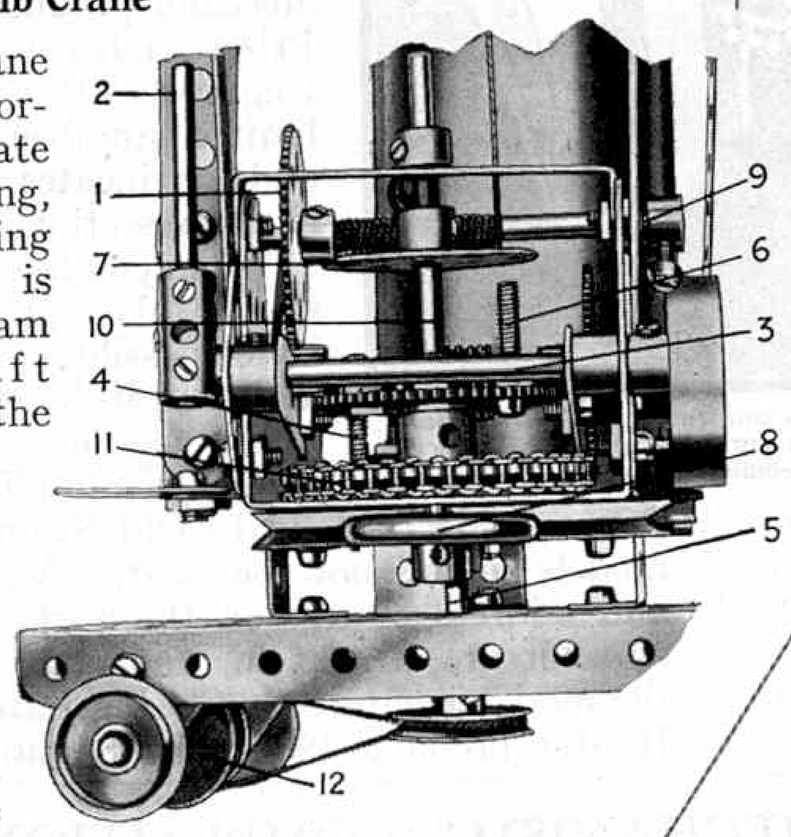


Fig. 1. (Right): General view of Steam-operated Jib Crane

The base plate of the Steam Engine forms the swivelling superstructure, and the shafts of the gear box are journalled in the perforated side plates of the Engine. The jib, which consists of $12\frac{1}{2}$" Strips also is secured to the Engine side plates and braced by $5\frac{1}{2}$" Strips. Cords attached to the head of the jib are secured to $5\frac{1}{2}$" Strips at the rear of the Engine.

In Fig. 2 an enlarged view of the gear box is shown. The secondary shaft of the Engine carries a Worm and a $\frac{1}{2}$" Pinion, the latter engaging with a 57-teeth Gear 1 on the hoist shaft. The latter also carries a Collar, in the boss of which a $\frac{3}{8}$" Bolt is secured so that it forms a "safety catch" when the Gear and Pinion are disengaged, the $\frac{3}{8}$" Bolt striking the Bolt 9 and thus preventing rotation of the shaft. A $3\frac{1}{2}$" Strip pivoted to an Angle Bracket, carries a $\frac{3}{8}$" Bolt which passes between two Collars on the hoisting shaft. Operation of the lever thus controls the hoisting movement.

The Worm secured to the secondary shaft engages with a 57-teeth Gear that is slidable on the Rod 10 (Fig. 2). This Gear carries $\frac{3}{4}$" Bolts 4 and 6 and can be raised or lowered by operation of the lever 2. The latter is held in a Coupling on the Rod 3, which is journalled in Flat Trunnions bolted to the Engine side plates. Two Cranks are secured to the Rod 3 and carry bolts inserted so that their shanks bear against the underside of the 57-teeth Gear Wheel.

When the Gear is lowered the Bolt 4 passes through one of the holes in the Sprocket 11 which is coupled to a $\frac{3}{4}$" Sprocket on a vertical Rod about which the superstructure is free to swivel, and thus rotates one pair of the travelling wheels by 1" Pulleys 12 and cord that can be seen clearly in Fig. 2.

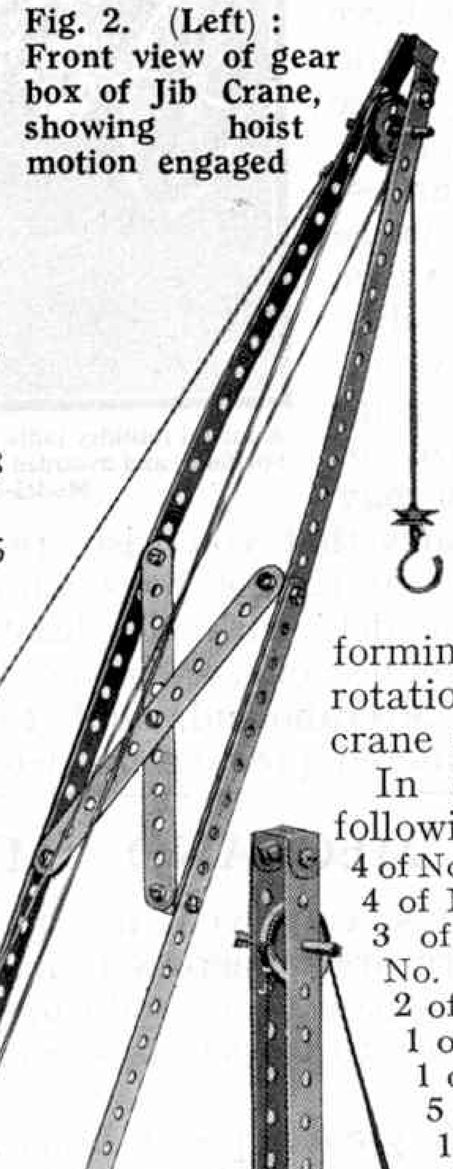


Fig. 2. (Left): Front view of gear box of Jib Crane, showing hoist motion engaged

On moving the 57-teeth Gear Wheel upward, the Bolt 6 engages with one of the holes in the Bush Wheel 7, which is secured to the shaft carrying the 1" Pulley fitted with Rubber Ring 8, and about which the Sprocket 11 is free to turn. The Rubber Ring presses against the rim of a 3" Pulley Wheel held by means of Double Brackets to the $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate forming the base of the model. On rotation of the Pulley 8, therefore, the crane swivels about its central pivot.

In order to build this model the following parts will be required:—

4 of No. 1; 4 of No. 2; 1 of No. 3; 12 of No. 5; 4 of No. 11; 9 of No. 12; 3 of No. 15a; 3 of No. 16; 2 of No. 17; 1 of No. 18a; 1 of No. 19b; 6 of No. 20b; 2 of No. 22; 1 of No. 22a; 1 of No. 23; 1 of No. 24; 1 of No. 26; 2 of No. 27a; 1 of No. 32; 3 of No. 35; 36 of No. 37; 5 of No. 37a; 1 of No. 38; 1 of No. 40; 1 of No. 44; 1 of No. 48a; 1 of No. 52; 1 of No. 57; 6 of No. 59; 2 of No. 62; 1 of No. 63; 8" of No. 94; 1 of No. 95; 1 of No. 96; 1 of No. 103f; 2 of No. 111; 1 of No. 111c; 1 of No. 115; 4 of No. 126; 2 of No. 126a; 1 of No. 155.

A Simple Pile Driver

The model shown in Fig. 3 represents a simple machine used for sinking wood or iron piles into soft ground.

The base of the model consists of a $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate to each side flange of which, a Flat Bracket is attached to support a $3\frac{1}{2}$" Axle Rod. A Bush Wheel fitted

Fig. 3. (Right): A simple but effective model of a Pile Driver

with a $\frac{3}{8}$" Bolt secured on this $3\frac{1}{2}$" Rod acts as a hand-wheel for winding the hoist cord.

Two $\frac{1}{2}$" Reversed Angle Brackets also are secured to the Flanged Plate and to these are bolted $12\frac{1}{2}$" Strips that form the guides between which the "driver" slides. These Strips are held together at their upper ends by a Double Bracket. The "sliding carriage" consists of two $2\frac{1}{2}$" Strips held apart by Angle Brackets and prevented from leaving the vertical guides by means of Flat Brackets. A number of $2\frac{1}{2}$" Strips are secured to the lower ends of the carriage to act as a heavy weight.

The hoist cord is first secured to a Bush Wheel on the hoist shaft, and then wound round the latter and passed over a 1" Pulley mounted at the top of the vertical guides. The other end of the cord is attached to an Angle Bracket, which is slipped under one lug of a corresponding Angle Bracket attached to the sliding carriage, and the whole can thus be drawn to the top of the guides. On reaching the top, the first-mentioned Bracket is automatically pushed clear and the released weight then falls, striking the pile.

The parts needed to construct the model are as follows:—

2 of No. 1; 9 of No. 5; 5 of No. 10; 1 of No. 11; 1 of No. 12; 1 of No. 16; 1 of No. 17; 1 of No. 22; 1 of No. 24; 2 of No. 35; 15 of No. 37; 1 of No. 37a; 3 of No. 48a; 1 of No. 52; 1 of No. 111c; 2 of No. 125.

Hand Operated Jib Crane

A good example of what can be done with only a few parts is the Jib Crane shown in Fig. 4. The base of the Crane consists of a $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate, and a 3" Pulley having a $1\frac{1}{2}$" Axle Rod secured in its boss is attached to this Plate by means of Angle Brackets. A second 3" Pulley is placed on the $1\frac{1}{2}$" Axle and to it are secured, by means of $\frac{3}{8}$" Bolts, two Sector Plates. The hoist shaft—a $3\frac{1}{2}$" Rod—is fitted with a Bush Wheel in which is secured two $\frac{3}{8}$" Bolts. One of these bolts acts as a handle while the other forms a "locking device," the shaft being pushed inwards and the Bolt engaging with a hole in one of the Sector Plates when it is required to keep the Rod stationary.

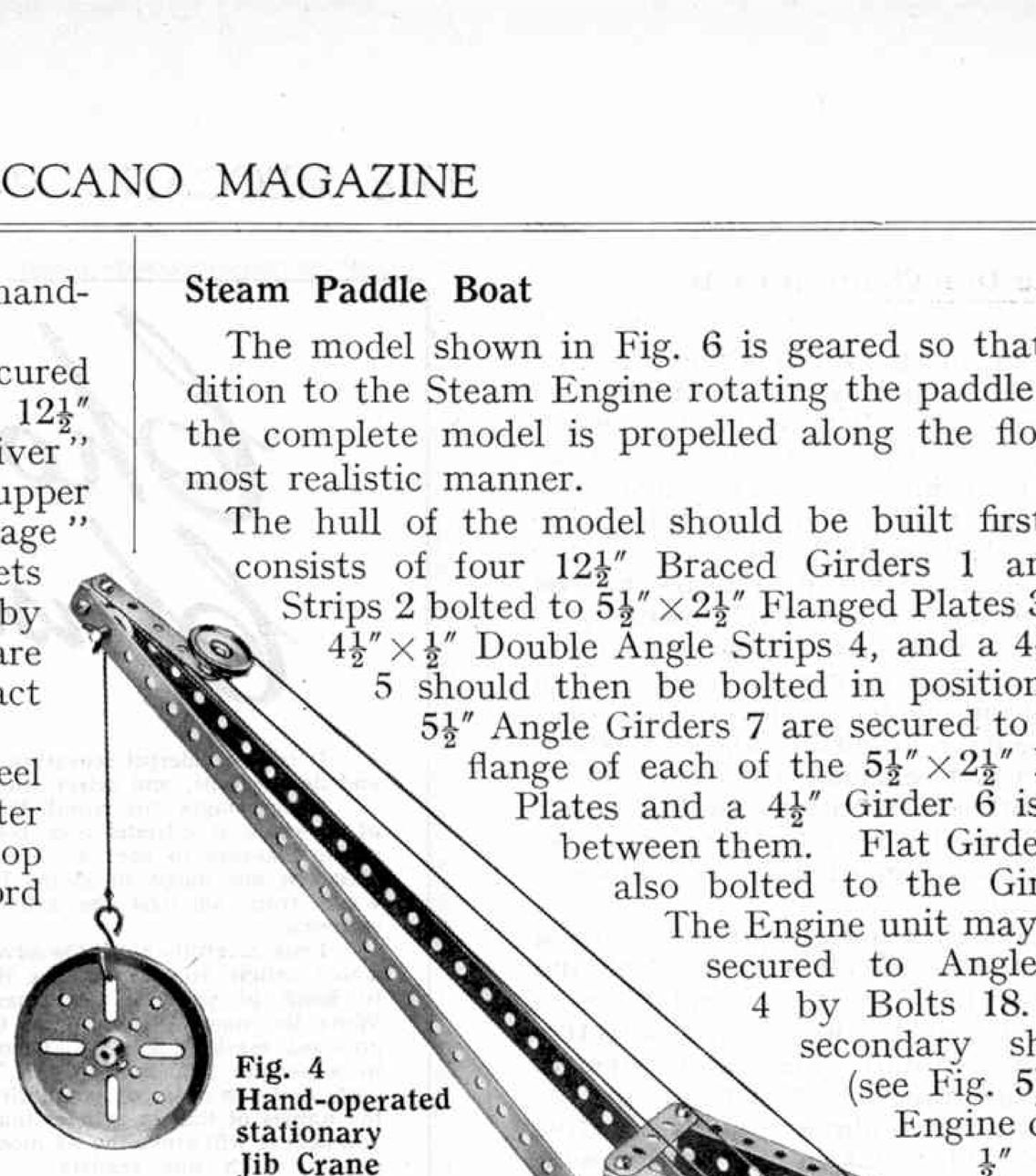


Fig. 4 Hand-operated stationary Jib Crane

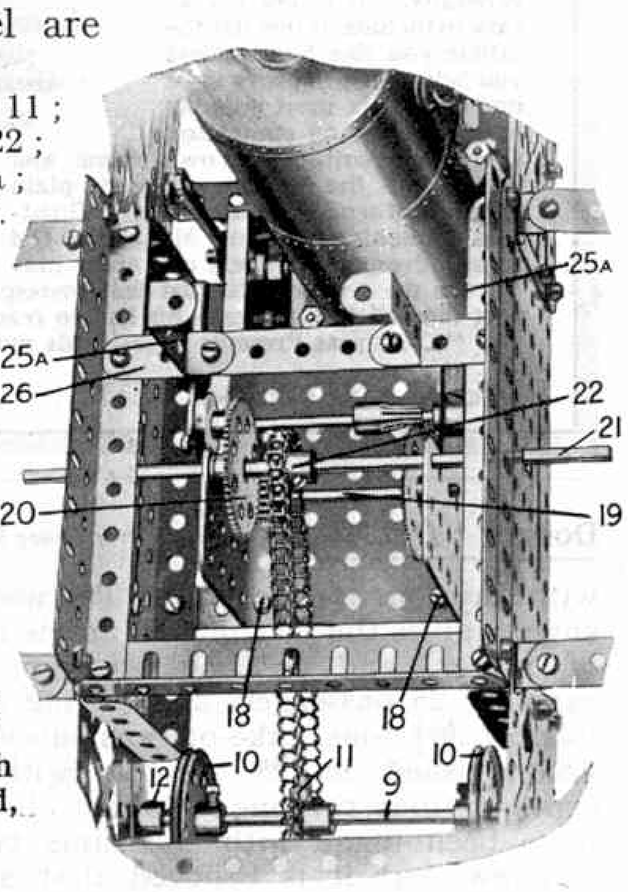


Fig. 5. (Above): Centre section of Paddle Boat, with top deck removed, showing transmission

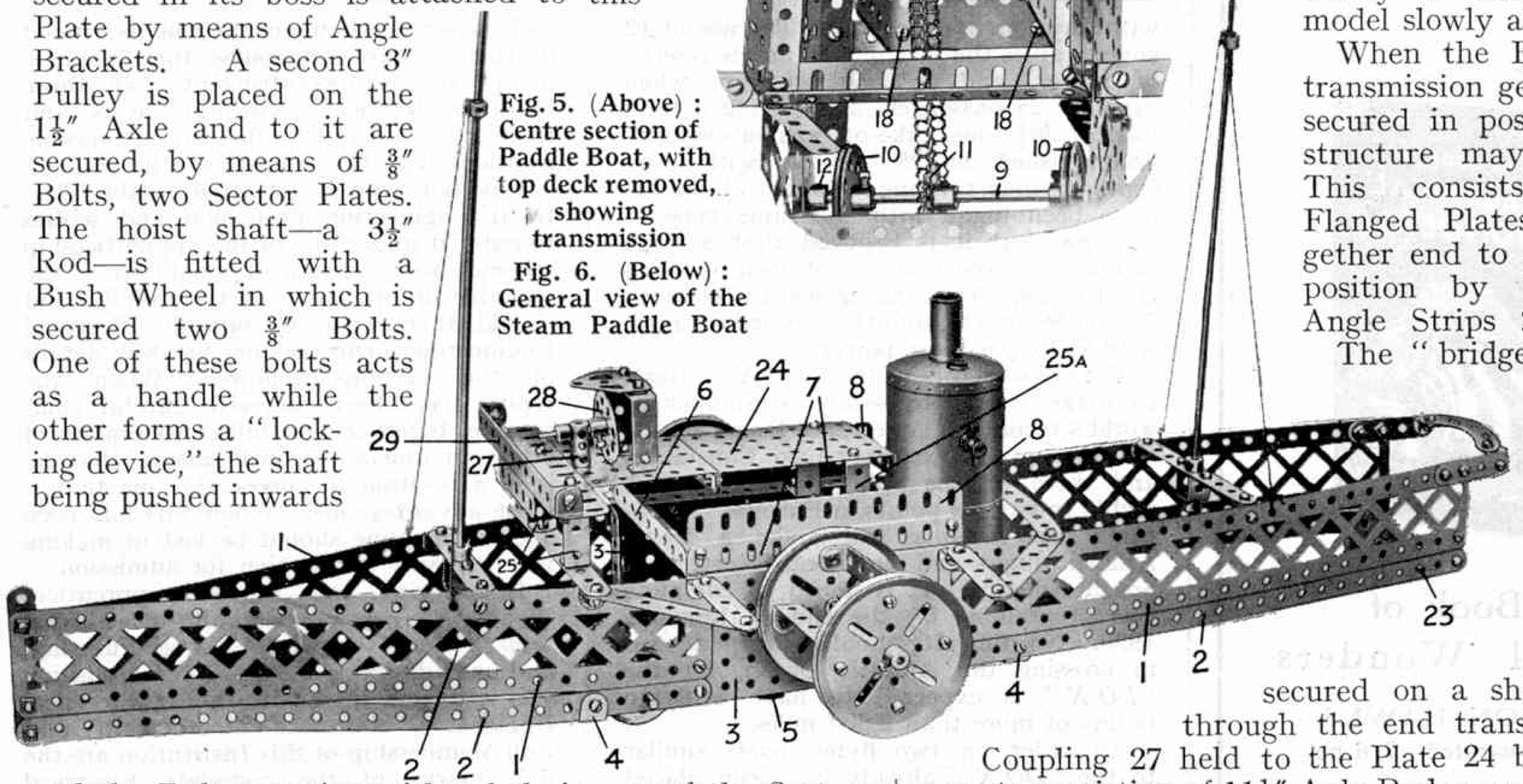


Fig. 6. (Below): General view of the Steam Paddle Boat

Luffing of the jib is effected by the $3\frac{1}{2}$" Crank Handle, a cord passing from it over a 1" Pulley secured to a $2\frac{1}{2}$" Strip at the jib head, and being tied to one of the Sector Plates.

Parts required to build the Jib Crane are:—

2 of No. 1; 4 of No. 5; 1 of No. 11; 5 of No. 12; 2 of No. 16; 1 of No. 17; 3 of No. 19b; 1 of No. 19s; 3 of No. 22; 1 of No. 23; 1 of No. 24; 6 of No. 35; 16 of No. 37; 5 of No. 37a; 1 of No. 52; 2 of No. 54; 1 of No. 57; 6 of No. 111c.

Steam Paddle Boat

The model shown in Fig. 6 is geared so that in addition to the Steam Engine rotating the paddle wheels, the complete model is propelled along the floor in a most realistic manner.

The hull of the model should be built first. This consists of four $12\frac{1}{2}$" Braced Girders 1 and $12\frac{1}{2}$" Strips 2 bolted to $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plates 3. Two $4\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips 4, and a $4\frac{1}{2}$" Strip 5 should then be bolted in position. Two $5\frac{1}{2}$" Angle Girders 7 are secured to the top flange of each of the $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plates and a $4\frac{1}{2}$" Girder 6 is bolted between them. Flat Girders 8 are also bolted to the Girders 7. The Engine unit may now be secured to Angle Strips 4 by Bolts 18. The secondary shaft 19 (see Fig. 5) of the Engine carries a $\frac{1}{2}$" Pinion engaging a 57-teeth Gear 20 on the Rod 21, to which the paddle wheels are secured. This Rod also carries a Sprocket Wheel 22 which transmits the drive to the Rod 9 by means of Chain passed over a further Sprocket 11. The $1\frac{1}{2}$" Pulley Wheels 10 propel the model slowly along the ground.

When the Engine unit and transmission gearing have been secured in position the superstructure may be assembled. This consists of $3\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plates 24 bolted together end to end and held in position by $1\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strips 25 and 25a.

The "bridge" consists of a $5\frac{1}{2}$" Flat Girder and a $5\frac{1}{2}" \times \frac{1}{2}"$ Double Angle Strip 29. The "steering wheel" which is represented by a Bush Wheel 28, is secured on a short Rod passed through the end transverse hole of a Coupling 27 held to the Plate 24 by a bolt. Two masts consisting of $11\frac{1}{2}$" Axle Rods complete the model.

The Paddle Steamer contains the following parts:—

4 of No. 1; 1 of No. 2; 3 of No. 2a; 5 of No. 3; 1 of No. 4; 4 of No. 5; 2 of No. 6; 2 of No. 9; 1 of No. 9a.; 2 of No. 10; 18 of No. 12; 3 of No. 13; 1 of No. 14; 1 of No. 15; 1 of No. 16; 1 of No. 16a; 2 of No. 18a; 4 of No. 19b; 2 of No. 21; 1 of No. 24; 1 of No. 26; 1 of No. 27a; 2 of No. 35; 83 of No. 37; 7 of No. 38; 2 of No. 45; 6 of No. 48; 8 of No. 48a; 2 of No. 48c; 1 of No. 48d; 2 of No. 52; 2 of No. 53; 12 of No. 59; 1 of No. 63; 1 of No. 89; 2 of No. 90; $9\frac{1}{2}$" of No. 94; 1 of No. 96; 1 of No. 96a; 4 of No. 99; 3 of No. 103; 1 of No. 126.

Print Your Own Christmas Cards

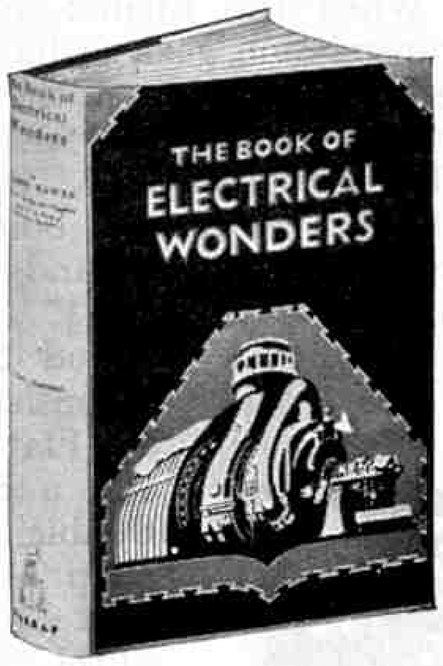
(*Continued from page 931*)

speaking, the most effective scenes are those that lend themselves to treatment on similar lines. It is astonishing how much action may be put into a drawing consisting of a few bold lines only. The illustration of a calendar that accompanies this article is an excellent example of this, for the seaplane depicted on it appears to rise from the water in a very lively manner.

The two drawings at the foot of page 930 also are excellent specimens of the art of printing from linoleum blocks, that of a galleon being noteworthy for its particularly effective treatment of the sea. These and the other illustrations to the article will form useful guides to those who take up the fascinating hobby of linoleum block printing.

An interesting means of introducing variety is the use of colour, both in ink and paper. For instance, the calendar design already referred to, looks most effective when printed in dark blue ink on paper of a pale blue tint. A treatment of the same design that is almost equally effective is the use of black ink in conjunction with a pale grey card. The drawing of a galleon produces an excellent effect when black ink and blue paper are used, the change of the colour of the paper being to increase the effect produced by the simple representation of the sea. For the other designs illustrated, orange or red paper may be used to advantage. The interest of a black and white print may also be increased by tinting with water-colours the various sections enclosed by the lines of the design.

Your Christmas Gift



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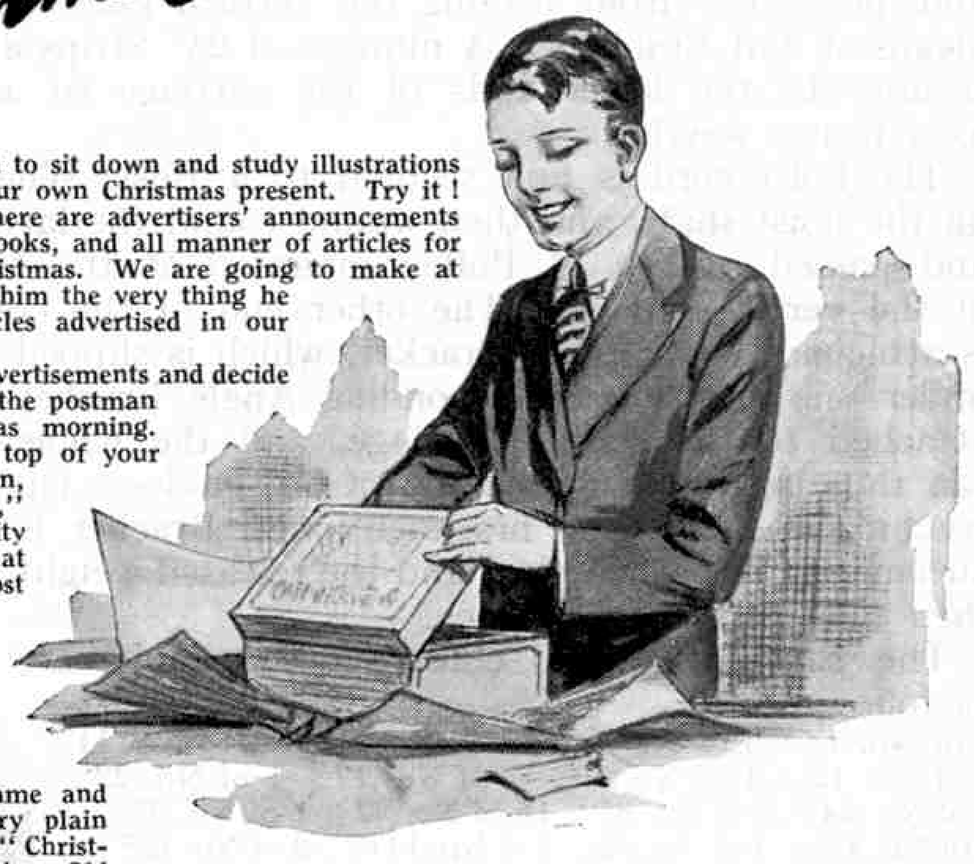


It is a wonderful sensation to sit down and study illustrations and descriptions, and select your own Christmas present. Try it!

In our pages this month there are advertisers' announcements of all kinds of splendid toys, books, and all manner of articles for giving pleasure to boys at Christmas. We are going to make at least one boy happy by giving him the very thing he wants from amongst the articles advertised in our columns.

Look carefully at all the advertisements and decide which article you would like the postman to hand to you on Christmas morning. Write the name of it on the top of your postcard, marking it "A." Then, in a second list, headed "B," write down in order of popularity the names of the six articles that you believe will prove the six most popular with our readers generally. It is not necessary to include in this list the article you like best, unless you believe it will prove to be one of the six most popular articles. Having completed list "B," write your own name and address at the bottom in very plain letters, and send the postcard to "Christmas Presents, Meccano Magazine, Old Swan, Liverpool." Only one entry may be submitted by each reader.

To the sender of the list that corresponds most nearly in order of merit with the total voting we will post the article that heads his list, to reach him on Christmas morning.

"Christmas Presents" postcards must reach us not later than 21st December.

MECCANO LIMITED OLD SWAN LIVERPOOL

Dornier "*DO.X*"—(*Continued from page 923*)

with any four engines idle. The use of 12 engines gives the machine an ample reserve of power, and on one occasion, when carrying 25 passengers and having a total load of 36½ tons, take-off was successfully accomplished in 28 seconds with only eight engines running. So far all flights have been made with the same type of airscrew, but it is believed that a large increase of speed may be obtained by using other types. The landing speed is between 70 and 90 m.p.h., and the power-load ratio is 18.51 lb. per horse power.

The constructors of the "*DO.X*" intend to make efforts to secure a number of world's records. A series of longer flights are to be carried out over Lake Constance, and these will be followed by extensive flights to various points in Europe. Eventually the machine will make a trans-Atlantic flight and visit both North and South America. It is hoped to complete this programme by the end of January, 1930. No difficulty should be experienced in crossing the Atlantic Ocean, for the "*DO.X*" is expected to have a flying radius of more than 2,500 miles.

An order for two flying boats similar to the "*DO.X*" already has been placed by the Italian Government, and it is expected that the first of these machines will be completed and ready for delivery early in the New Year.

It is remarkable that the "*DO.X*" should appear at a time when interest in airships is reviving. To these the huge flying boat is a formidable rival. It is able to carry a large paying load and is much cheaper than an airship such as "*R.100*," for its cost was only £100,000, or less than a quarter of that of the British airship.

What Shall I Be—(*Continued from page 919*)

and young men living in the neighbourhood of their works. Of course their requirements are no less stringent than those of other electrical engineering firms, and those who hope to take up responsible positions with them must be fully trained.

Any boy who is attracted to the Electrical Engineering profession and wishes to enter it under one of the apprenticeship schemes above described should study the valuable information very carefully and should then write to suitable Electrical Engineering firms asking for full details of the systems followed. When the replies have been received, careful comparison, together with full consideration of other circumstances, will ensure that he is in a position to choose the one that is most advantageous. When this has been decided no time should be lost in making the necessary application for admission.

Engineering and student apprentices should take every opportunity of widening their general knowledge of engineering, and one admirable means of accomplishing this is to join the Institution of Electrical Engineers. Associate Membership and Full Membership of this Institution are the hall marks of the complete Electrical Engineer and carry with them the right to the use of the coveted letters "A.M.I.E.E." and "M.I.E.E."

This eminence is only attained after a period spent as a Student or Graduate, but those in the two last-named classes have the privilege of attending meetings of the Institution in London or in provincial centres. Full details may be obtained from the Secretary, The Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2.

OBJECTS of the GUILD

To make every boy's life brighter and happier.

To foster clean-mindedness, truthfulness, ambition and initiative in boys.

To encourage boys in the pursuit of their studies and hobbies, and especially in the development of their knowledge of mechanical and engineering principles.

The Meccano Guild

With the Secretary

A Merry Christmas!

My first task is the very pleasant one of wishing to all members of the Guild and of Meccano Clubs in all parts of the world a very happy and enjoyable Christmas. I hope that every member of the Guild will receive large additions to his stock of Meccano and Hornby Trains, and that to club members the Christmas season will bring happy social evenings and greatly increased opportunities for enjoyment of their favourite hobby.

Best Time for Recruiting

From reports that have reached me I am certain that the officials and members of every club will be extremely busy during the month of December, but I hope that in the midst of the excitement of the Christmas season they will not forget that it provides them with a golden opportunity for recruiting. At Christmas time many boys make the acquaintance of Meccano for the first time. They see it in the shops and are so attracted by the handsome models displayed that they adopt the usual means of persuading parents and rich relatives to present them with outfits. Their next step is to look for friends with whom to share their enthusiasm, and that is the moment when they may most easily be induced to join a club. I hope that in every club the festive season will be put to good use in this manner.

I also wish to give a word of advice to lone members of the Guild. While it is very enjoyable to build models at home, the last ounce of fun cannot be extracted from the hobby except in association with other keen Meccano boys, and wherever possible new Guild members should take steps to become members of the local Meccano club. If the names and addresses of the Leader and secretary are unknown to any boy wishing to join a club, they will be supplied to him immediately on application to Headquarters.

Improving the Programme

The end of the first winter session is in sight, and a suitable opportunity of taking stock of the position shortly will arrive. This is a more important event than is usually thought to be the case, and I strongly advise Leaders to spend a portion of the final meeting in talking over with members the events of the session. Each item of the programme should be reviewed in turn, and it should be asked if this kind of meeting has been a success, or if that hobby has repaid the time and energy spent on it. A discussion of this kind, in which every member is encouraged to speak freely, clears the air considerably and helps to promote a feeling of confidence between officials and members. It also ensures that the programme for the following session must be on the lines desired by a majority of members.

Meccano Club Leaders

No. 42. Mr. J. R. Drysdale

Mr. J. R. Drysdale is joint Leader with Mr. R. Thomson of the Preston Embee M.C., and also acts as secretary. This club was affiliated in March, 1927, and members have concentrated strongly on Model-building and excursions to places of interest. One particularly enjoyable visit was paid to Liverpool, where members inspected the Docks, an Atlantic liner, and—most interesting of all—the factory of Meccano Limited

Making Exhibitions More Attractive

In reviewing the activities during 1929 I have been greatly impressed by the effective use that clubs have made of Exhibitions and Visitors' Nights. To-day there is scarcely a club that at some time during the winter session does not hold at least one successful exhibition.

Formerly the attractions at such functions consisted almost entirely of Meccano models made by members, together with one or two large super models and perhaps a Hornby Train Layout. These are, of course, absolutely essential, but in well-conducted clubs now are supplemented by the exhibition of the interesting models that may be obtained on loan from Headquarters. These always arouse special interest among visitors.

For instance, to-day no Exhibition is regarded as complete unless it includes a Meccanograph, or Harmonograph, or even both. The special merit of these models is that visitors themselves may work them, and they are so greatly attracted by the opportunity of making designs for themselves that they willingly pay a small fee for the privilege. In fact, they usually are unable to refrain from making more than one, and their appreciation of the work of the club increases accordingly—and with it the club funds!

In connection with these models I should like to recommend an excellent plan that has been followed at the Exhibitions held by several clubs. At these specially attractive designs have been prepared and displayed alongside the model. Many visitors probably will desire to make reproductions of these, and therefore a careful note of the setting of the model necessary to produce them should be made.

Another pleasing feature of many Exhibitions that adds interest is that visitors see what is done at ordinary meetings, for during the Exhibition members carry on various activities that enter into the club's programme. In one club, for instance, fretwork and casting forms a prominent feature of the programme, and work of this kind is in operation for the benefit of visitors at the Annual Exhibition. This enables visitors to realise how the members enjoy their hobbies and make them of service.

Proposed Clubs

Attempts are being made to form Meccano Clubs in the following places and boys interested should communicate with the promoters whose names and addresses are given below:—

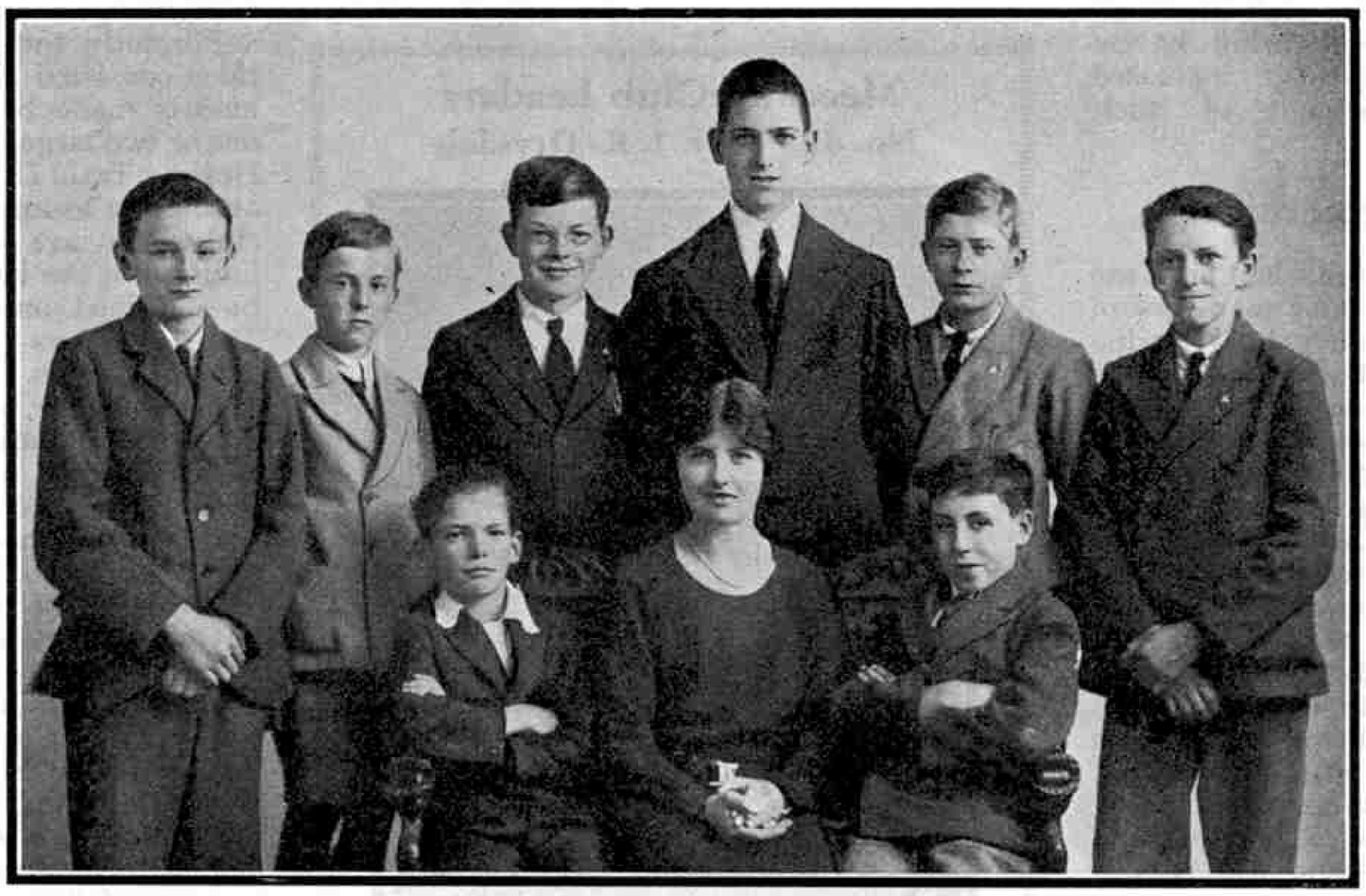
BIDEFORD—H. L. Farr, Lavington House, Bideford, Devon.
BROMSGROVE—W. Hill, 2, Princess Buildings, Birmingham Road.
KNOCKLONG—D. O'Grady, Ballylanders, Knocklong, Co. Limerick.
PENZANCE—Sidney Bishop, 23, Wesley Street, Hea Moor, Cornwall.
WELLINGTON—W. Howells, 53, Orleton Lane, Wellington, Salop.

Lindisfarne College M.C.—A Debate was held in conjunction with the School Debating Society on the question "*That the Debating Society Does More Useful Work than the Meccano Club*"; the result was an easy victory for the Meccano Club. Visits have been paid to the local Electrical Generating Station, the Gas Works, and the Telephone Exchange. Other meetings have included a Cinema Show, at which several interesting films were exhibited, Contractors' Night, Lantern Lectures, and papers on Travel and Science read by members. Club roll: 29. *Secretary*: H. H. Sebel, 27, Seaforth Road, Westcliff-on-Sea, Essex.

Greenock Academy M.C.—The present session began with a well-contested Model-building Competition. Prizes of 5/- and 2/6 were awarded to the winners, both of whom exhibited models of Cranes. Visits to local Shipyards and to the Observatory at Paisley are being arranged. Club roll: 48. *Secretary*: L. Langtry, 81, Newton Street, Greenock.

Attenborough Church Choir Boys' M.C.—Has now secured affiliation. A prize Model-building scheme has been introduced. Marks are awarded on each Model-building Evening, and a prize of Meccano parts will be awarded on points scored during the session. Club roll 8. *Secretary*: G. Render, "Chilboro House," Attenborough Lane, Chilwell, Notts.

Middlesbrough M.C.—First Aid work now forms part of the programme, instruction being given by Sergeant Hewitt of the Middlesbrough St. John's Ambulance Brigade. On the first Ambulance Night a lecture was given by Superintendent Walker, of the same Brigade. Members pay a fee of 1/- for the full course and examination, and receive a certificate if successful. A sensation was caused by a Badge Parade arranged by the Leader. All members were required to parade wearing Guild Badges, those not possessing one being reprimanded and given application forms. The club continues to show excellent progress, and there was a record attendance at the recent Annual General Meeting. Club roll: 74. *Secretary*: A. Bradley, 95, Deepdale Avenue, Marton Grove, Middlesbrough.



Visitors to Meccanoland. Our photograph shows a group of members of St. Alban's M.C. who recently enjoyed a tour of the works of Meccano Ltd. at Liverpool. The party was in charge of Miss Constance Brookes, Leader of the club, who is seated in the centre of the group

Victoria (Glasgow) M.C.—At a joint meeting with the Morrison Memorial M.C. a very interesting Lecture was given by Mr. R. Croall, of Edinburgh, on his visit to the Meccano Factory in Liverpool. A Lantern Lecture on "*The Western Highlands*" also was greatly enjoyed. Fretwork and Stamp Collecting sections have been formed, and Model-building continues to be the chief pursuit of members. In a recent Competition the subject for Model-building was "*Anything connected with Railways.*" Mr. H. C. Thompson, Leader of the club, is giving a series of talks on "*Mechanisms.*" Club roll: 35. *Secretary*: R. Hannah, 52, Thornwood Avenue, Glasgow, W.1.

Herne Bay M.C.—A large party of members made an interesting tour of the works of Messrs. H. M. Biggleston & Sons, Iron and Brass Founders, Canterbury. It was at the foundry of this firm that the first marine torpedo was manufactured. The seventh birthday of the club was celebrated by a Social Evening, a splendid Birthday Cake being made for the occasion by Mrs. Russell, who was heartily thanked for her kindness. The club has purchased a Lantern and interesting Lectures already have been arranged. The newly-formed Blue Triangle Football Club, recruited from Members of the Senior Section, are having a successful season. Club roll: 50. *Secretary*: C. W. Russell, 4, Clifton Villas, Herne Bay.

Tynecastle School M.C.—Visits have been paid to the Haymarket Locomotive Sheds of the L.N.E.R., and to the works of Redpath, Brown Ltd., Constructional Engineers. Model-building is the chief pursuit, but papers by members are read regularly, the first being an excellent account of "*Motor Car Construction.*" Club roll: 50. *Secretary*: Wm. Urquhart, West Mill Road, Colinton, Edinburgh.

Braintree County High School M.C.—Is running a Football Club. A captain was elected at the business meeting held at the beginning of the session, and an excellent fixture list has been arranged. A Model-building Contest produced a very large number of entries, including original models of a Travelling Crane, Aero Engine Testing Machine, and a Dessouter Sports Coupè Aeroplane. Club roll: 29. *Secretary*: P. Allen, St. Edmunds, Bocking, Braintree, Essex.

Wimbledon M.C.—A Meccano Clock is being constructed for exhibition in a shop window during the Christmas Holidays. Firework Display, and the reading of a ghost story have occupied other evenings, and a lecture has been given on "*Australia.*" Club roll: 24. *Secretary*: M. O. Carroll, 34, Drax Avenue, Wimbledon, S.W.20.

St. Bartholomew's (Plymouth) M.C.—Members have been divided into four sections in order to encourage team spirit. On Model-building Evenings Motor Cars and Cranes have been constructed. Several Debates on controversial subjects have been held, these including "*Rail v. Road Transport*" and "*Meccano v. Hornby Trains as Hobbies.*" The club magazine "*The Gearbox*" continues to be popular, and the third number contains many interesting articles in addition to reports of meetings. Club roll: 45. *Secretary*: K. Wills, 8, Beechwood Avenue, Mutley, Plymouth.

Falmouth Wesley M.C.—A splendid Lecture was given by Mr. Woodville on "*Knots and Splicing,*" and a Charabanc trip to St. Keverne have been outstanding incidents. At St. Keverne members were allowed the privilege of ringing the ancient bells of the tower. Mrs. A. A. de Pass has given the club a splendid Meccano set, and a Gramophone has been contributed by Mr. S. Walkey. Members are greatly indebted to these generous supporters. Club roll: 33. *Secretary*: V. Jordan, "Trevose," Langton Terrace, Falmouth.

Holy Trinity (Barnsbury) M.C.—The Eleventh Exhibition was highly successful, the gross receipts amounting to nearly £9. A large number of original models constructed by members were on view, in addition to the Two-cylinder Horizontal Steam Engine, the Pontoon Crane, and the Harmonograph. Lantern Lectures on "*Scenes in Australia*" were given by Mr. C. Hawkins, formerly Leader of Hobart (Tasmania) M.C., who also kindly presented prizes and judged Meccano models. Additional attractions included an extensive Hornby Train Layout and Handicraft Exhibits, the latter being judged by the Rev. T. G. Mohan, M.A., Patron of the club. Club roll: 45. *Secretary*: Mr. F. W. Johnson, 23, Market Street, Edgware Road, London, W.2.

Bedlington Secondary School M.C.—Members visited the site on which a new railway bridge across the River Blyth is being constructed. Mr. Rhodes, the engineer in charge of the operations, conducted the party round. A further visit is to be paid at a later stage, and it is hoped that Mr. Rhodes will give a Lecture on "*Bridge Construction.*" A visit has been paid to the Fire Station and other meetings have taken the form of Debates. Club roll: 21. *Secretary*: J. W. Dobson, 1, Portland Terrace, Ashington, Northumberland.

Harwich M.C.—Three evenings per month are devoted to Model-building and other hobbies, and one evening to Games, a Lantern Lecture or a Social. Members have been divided into sections for Model-building, Woodwork, Fretwork, etc., a senior member being at the head of each section. Members have been delighted to welcome Capt. P. L. Whittingham, C.A., who has returned to Harwich after two years' absence, and has taken up his former position as one of the Club Leaders. *Secretary*: A. E. Ward, Osborne House, Pepys St., Harwich.

Chertsey M.C.—A Lecture by Ex-Sergeant Major Brown, R.H.A., on "*My Experiences in the Great War,*" greatly interested members. Model-building Competitions are frequently held. In one of these members constructed two models, a Ship's Gangway and a Drilling Machine. Prizes were given for quickness and accuracy. In a Bridge-building Contest members were divided into two sections, and the rivalry was intense. Club roll: 24. *Secretary*: E. V. Brown, Arbon Grove Cottage, Lyne, Chertsey.

Stockton-on-Tees M.C.—A Christmas Club has been started in order to assist members to increase their stock of Meccano parts. Model-building Evenings have alternated with Games Nights, Table Tennis being very popular. A talk on the "*Schneider Trophy Race*" was given by the Leader. Club roll: 37. *Leader and Secretary*: N. Middleton, 14, Victoria Avenue, Norton Hill, Stockton-on-Tees.

Roe Green M.C.—Model-building evenings are devoted chiefly to construction of large models, many of which are designed for use with the Hornby Train Layout possessed by the club. The Library has proved a great success and a Clock Golf Tournament aroused great interest. Club roll: 18. *Secretary*: P. J. Wallis, 1, Elmwood Crescent, Hay Lane, London, N.W.9.

Greenford M.C.—Members have visited a Glass Works and are now preparing for a Concert. At other meetings models for use on a Hornby Train Layout have been constructed. Club roll: 8. *Secretary:* H. Tillman, 161, Costons Lane, Greenford.

Bridport Grammar School M.C.—Model-building continues to be the chief feature, but at alternate meetings lectures on "*Electricity and Magnetism*" are being given by Mr. Alston, the Leader. Club roll: 19. *Secretary*: J. Guppy, 20, King Street, Bridport, Dorset.

Denmark

Odin M.C.—The secretary gave an interesting Lecture on his experiences at the Scout Jamboree at Arrowe Park, and on his visit to the Meccano Factory at Liverpool. On Model-building Evenings the models in the "*Meccano Book of New Models*" are being constructed and a Crane-building Competition has been held. Club roll: 12. *Secretary*: A. Thiele, Langelinie 53, Odense, Denmark.

India

Georgetown (Madras) M.C.—A lecture on "*Surveying*" was given by Mr. C. R. Naidu, B.A. Members visited the Government Trades' School, where they were greatly interested in models of machines constructed by engineering students. Several indoor games have been introduced. Club roll: 13. *Secretary*: S. N. Thangaveloo, No. 76, Nattu Pillayar Kovil St. G. T. Madras, South India.

President: Mr. Frank Hornby—Inventor of Meccano

What the Guild Means

The Meccano Guild is an organisation for boys, started at the request of boys, and conducted as far as possible by boys. In joining the Guild a Meccano boy becomes a member of a great brotherhood of world-wide extent, every member of which has promised to observe its three great objects; wherever he happens to be—even in strange countries—he will know he has met a friend whenever he sees the little triangular badge. The Meccano Guild is bringing together Meccano boys all over the world, and is helping them to get the very best out of life.

How it Commenced

More than a million boys in Great Britain derive their greatest indoor pleasure from Meccano. Before the Guild was formed, hundreds of these Meccano boys wrote to us every week. They told us how they wished they could be put into communication with other Meccano boys and how they longed to be able to meet them. They asked if arrangements could be made so that their wishes might become an accomplished fact. We responded to their repeated and increasingly numerous appeals, and as a result the Meccano Guild came into being.

Why You Should Join

Every Meccano boy should be a member of the Meccano Guild. All who have studied its objects must agree that the Guild cannot fail to have a profound effect for good on the lives of its members. It is ready to be of service to each individual member—to help or give advice whenever requested. At the head—guiding and controlling, and taking a personal interest in this great movement—is the President, Mr. Frank Hornby, Inventor of Meccano and Managing Director of Meccano Limited.

The Headquarters of the Meccano Guild are at the Head Offices of Meccano Ltd., Binns Road, Old Swan, Liverpool.

HOW TO BECOME A MEMBER

Membership of the Guild is open to every boy possessing a Meccano Outfit, or Hornby Train Set, who satisfactorily fills in the prescribed application form. The only conditions are that members promise to observe the objects of the Guild and to wear their badges on all possible occasions.

The price of the Guild membership badge is 7d. post free in the United Kingdom, and 1/– post free abroad. A remittance for the necessary amount should be sent along with the form of application. The Guild badge is beautifully enamelled in blue and white and is made for wearing in the lapel of the coat.

In addition to the badge, each member receives a membership certificate, measuring 7″ × 9½″. This certificate is printed in orange and sepia and in design is a smaller edition of the large club certificate.

Write to the Secretary of the Meccano Guild, Binns Road, Old Swan, Liverpool, asking for an application form and full particulars. Then fill in the form and return it to Headquarters, when your badge and certificate will be sent you.

Boys living overseas should write to one of the Meccano agents at the following addresses: CANADA: Meccano Ltd., 45, Colborne Street, Toronto. AUSTRALIA: Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W. NEW ZEALAND: Models Ltd., Kingston & Federal Streets, Auckland. SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Market Street, Johannesburg.

MECCANO CLUBS

Meccano Clubs are founded and established by enthusiastic Meccano boys under the guidance of the Guild Secretary at Headquarters. At the present time there are more than 250 affiliated clubs in various towns and villages in this country and abroad, together with a number not yet affiliated. If the nearest club to you is too far away for you to join, or if you are unable to join for any other reason, consider the possibility of forming a new club in your own district. A special booklet explaining "How to run a Meccano Club" is now ready, and will be sent to any reader (post free) on receipt of 2d. in stamps.

When a Meccano Club has been successfully launched and good progress is being made, affiliation with the Guild is granted. A beautiful club certificate, suitable for framing and hanging in the club room, is presented, and the club becomes entitled to many privileges, including the loan of interesting lectures.

All members of the Guild are eligible for the Merit Medallion, which is awarded to those who display special ability in connection with club work, or in helping the Guild.

THE CORRESPONDENCE CLUB

Members of the Guild are able to join the Correspondence Club, by which they are placed in communication with other Guild members of similar age and interests who live in some other part of the country or abroad.

THE GUILD RECRUITING CAMPAIGN

Every Meccano boy should become a member of the Guild and do his utmost to help to make the objects of the Guild widely known. With this end in view, a Special Medallion is presented to each member of the Guild who obtains three new recruits. As a mark of further merit the medallion is engraved with the name of the recipient and with the words "Special Award" when six more members are recruited, making nine in all. Full particulars of the Recruiting Campaign, together with a supply of application forms, will be sent on request.

THE THREE GREAT OBJECTS OF THE GUILD

(1) **To make every boy's life brighter and happier.**

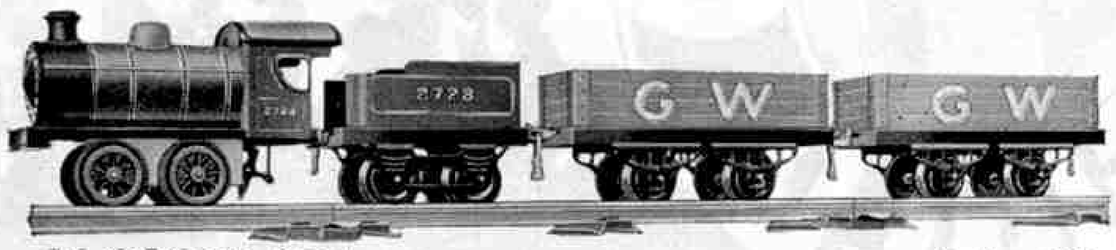
(2) **To foster clean-mindedness, truthfulness, ambition, and initiative in boys.**

(3) **To encourage boys in the pursuit of their studies and hobbies, and especially in the development of their knowledge of mechanical and engineering principles.**

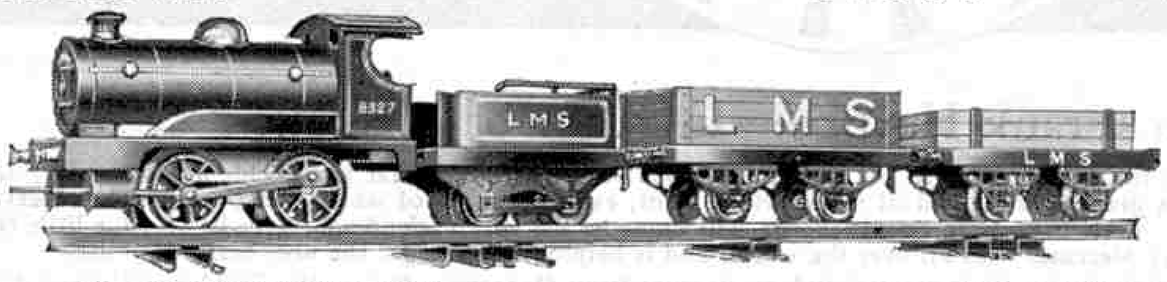
BADGE OF MEMBERSHIP

CLUB LEADER'S BADGE

STRONGER MECHANISM



M GOODS SET *Price 8/6*



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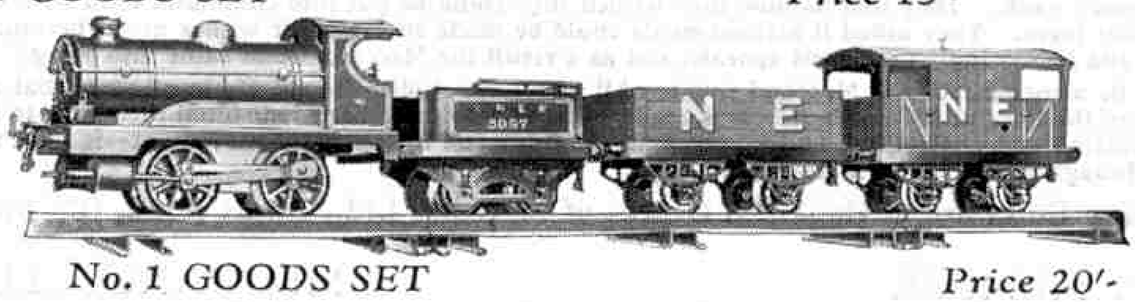

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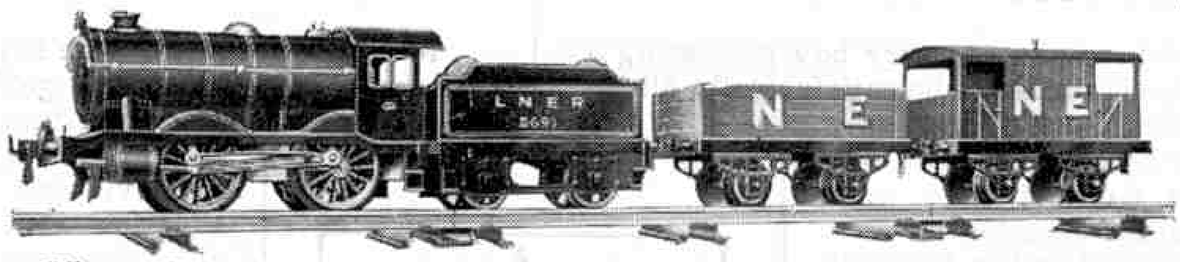

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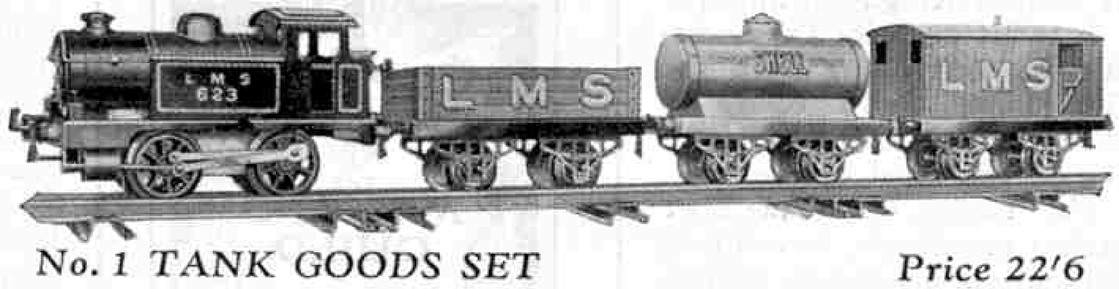

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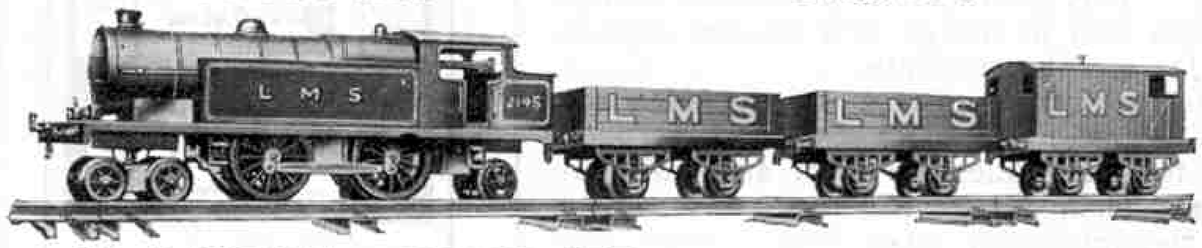

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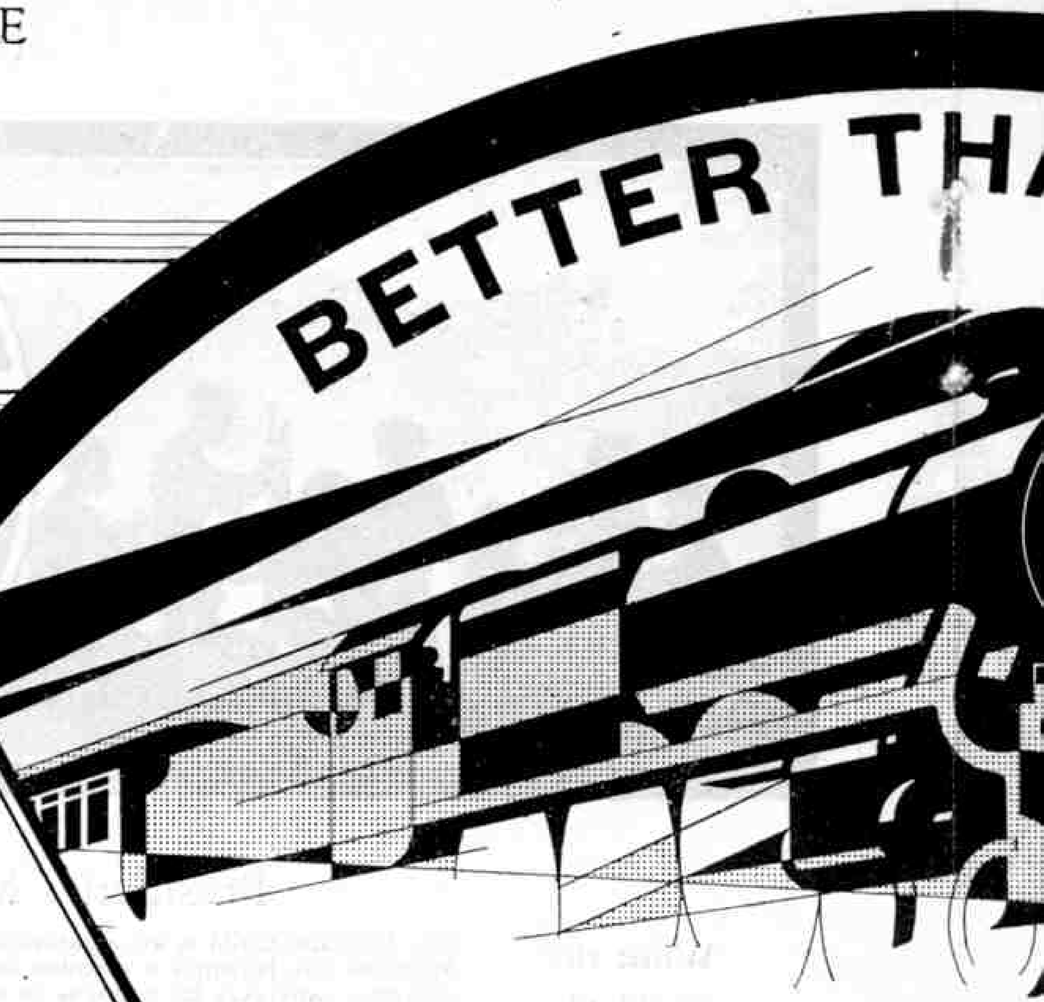

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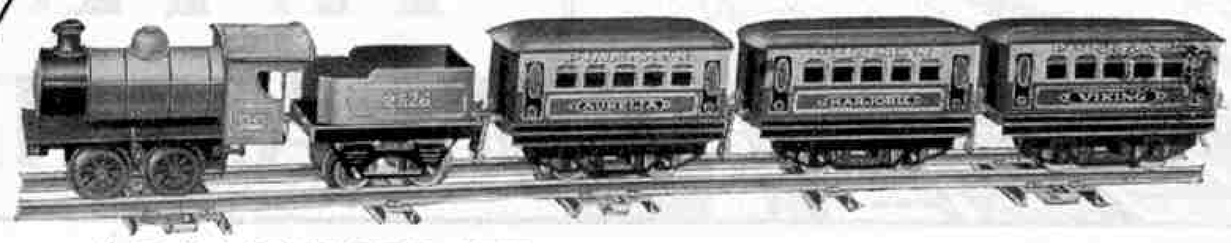

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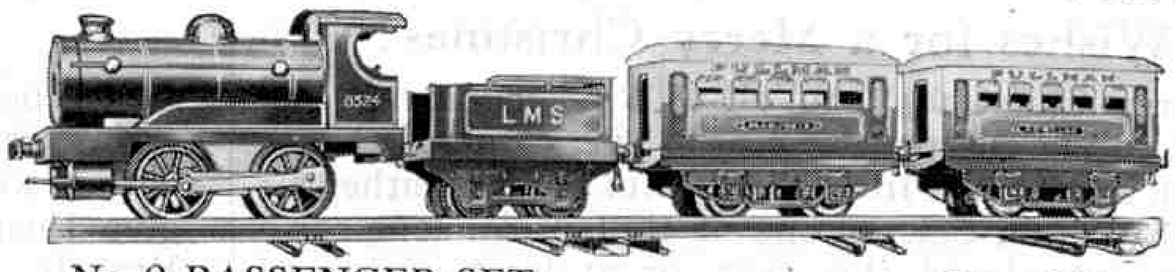

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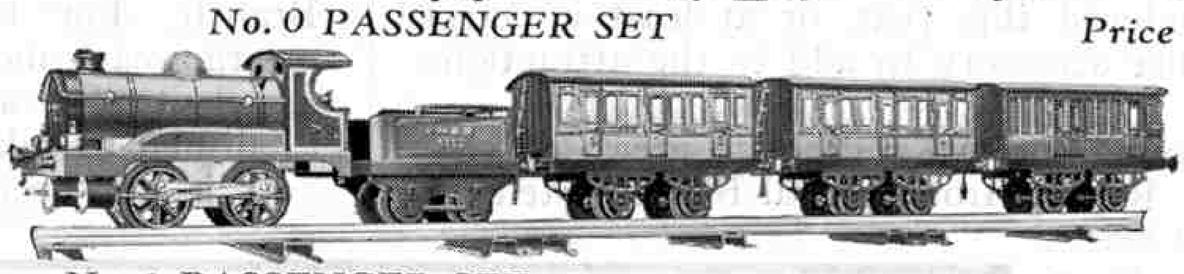

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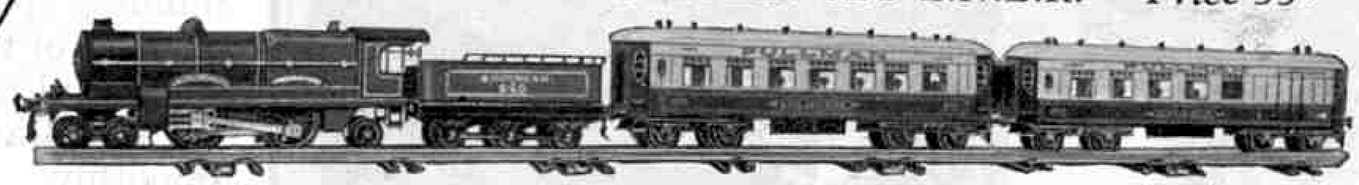

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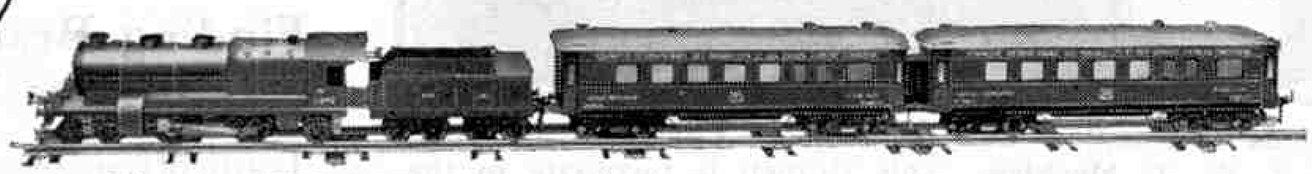

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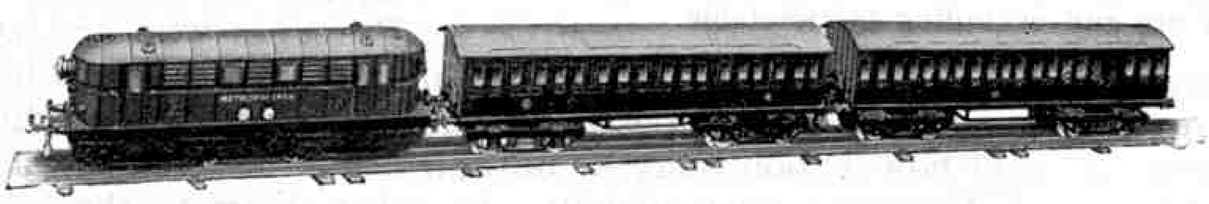

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No. 1 Passenger Set	... 25/-
No. 1 Special Passenger Set	32/6
No. 2 Special Pullman Set	55/-

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BRITISH AND UARANTEED **TRAINS**

ACTURED BY
OLD SWAN LIVERPOOL

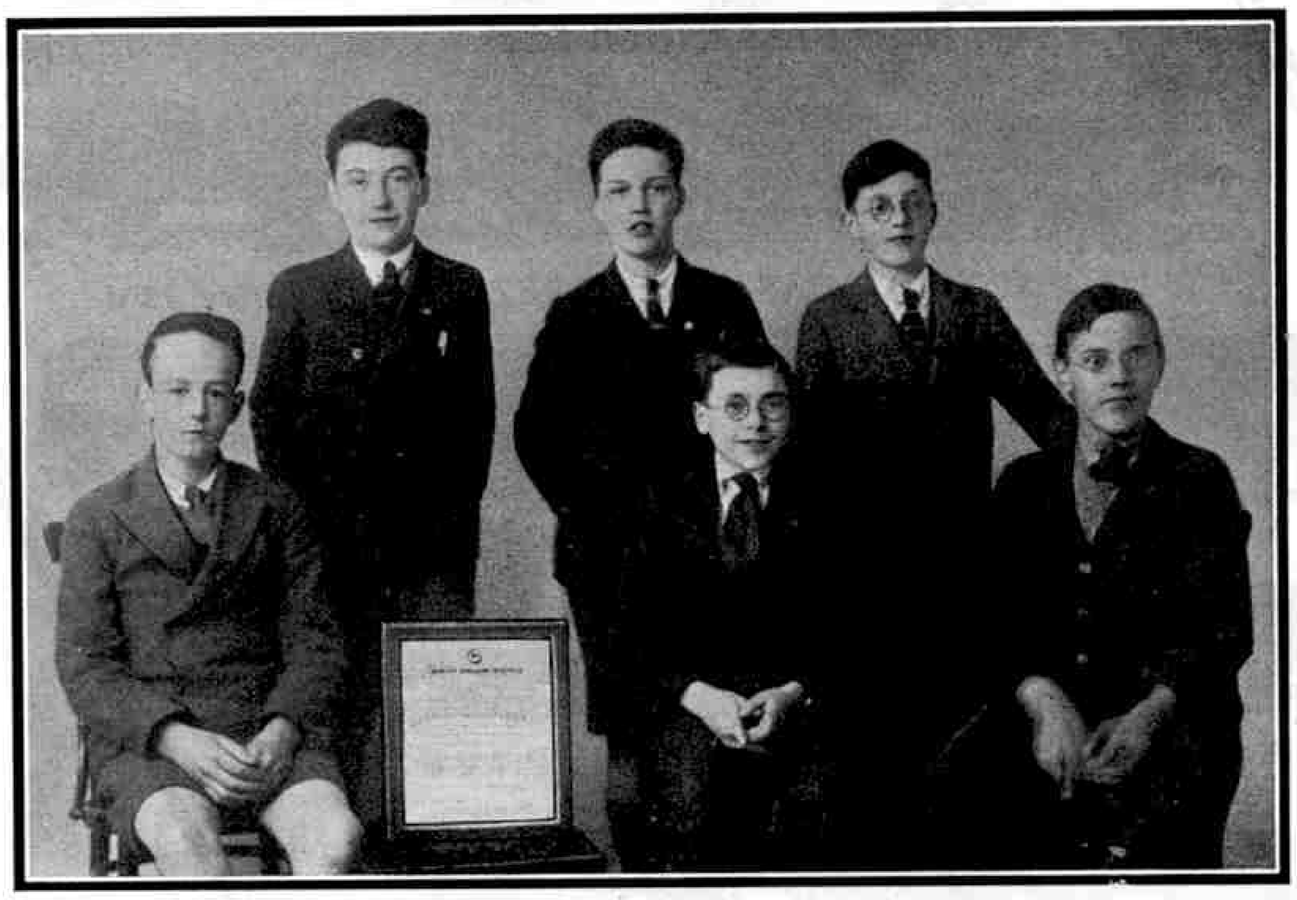
Best Wishes for a Merry Christmas!

"A Merry Christmas" to all H.R.C. members! I hope that during the present season every one of them will receive as presents from thoughtful parents either a new Hornby Train Set, or one of the special long-run locomotives introduced this year, or at least a petrol tank or some other accessory to add to the attractions of their layout.

During the coming weeks I anticipate great activity in the Branches. Reports from several Branches tell me that during the Christmas and New Year Holidays the extra time at the disposal of members will be devoted to extending the Branch layout and also to collecting information of value and interest by means of visits to local stations and goods yards. I am very glad to hear this and hope that their example will be followed by the members of all Branches.

Holidays provide a splendid opportunity for systematic work of many kinds, for school tasks and other duties are temporarily suspended, or at least moderated in extent. One task that profitably may be undertaken is the overhauling of Branch railway material and the planning and construction of an entirely new layout on which to work during the next session. Others are the making and fitting of scenic accessories, and of more elaborate signalling systems.

While serious work of this kind should not be forgotten, there is no reason why it should claim the whole of members' attention. The Christmas season is traditionally associated with fun and revelry and even if an elaborate social evening cannot be arranged, every club should devote at least one meeting to an event of this kind, for games and refreshments add to the good humour of the members. The refreshments need not be costly, but in most clubs no difficulty will be experienced on this score, for if the funds of the Branch will not run to the purchase of good things to eat, a little persuasion on the part of members no doubt will extract suitable contributions from mothers and sisters.



Members of the St. Chads (Withington) Branch, No. 56: Chairman, Mr. V. R. Mackley; Secretary, R. W. T. Mackley. This Branch is fortunate in the possession of a splendid permanent layout, and on it very realistic goods and passenger services are run according to timetable

Games at Branch Meetings

Members seldom weary of the delight of running their trains around a properly signalled track in accordance with a well-organised timetable, but a little variety will give them renewed zeal for the chief purpose of the Branch. For this reason in certain Branches one meeting each month is set aside for games. This is an excellent plan and I strongly recommend all Branch Chairmen to take similar steps.

It is not necessary to devote an entire meeting to these activities however, and another good idea adopted in many Branches is to devote ten minutes or a quarter of an hour at the end of each meeting to an active indoor game. Suitable games that may be played with quite simple appliances are Basket Ball and Table Tennis. A few minutes spent in lively exercise of this kind is a wonderful help in keeping the Branch running smoothly.

Finding Branch Rooms

I am often asked for advice by officials of Branches who are having difficulty in finding a suitable room in which to hold meetings. It is impossible for me to say definitely where and how a room may be obtained, for the circumstances of Branches vary widely. In most districts there are suitable rooms that may be hired, and the Chairman and Secretary of a Branch in search of accommodation should get into touch with those concerned. Very often the Secretary of the Y.M.C.A., a local Scout-master, or the Minister of a church in the neighbourhood may be found sympathetic and willing to help in this connection.

Several Branches have their paths made easy by local Hornby Train dealers, who have kindly allowed them to use rooms on their premises. In some cases they occupy honorary official positions in the Branch, and are very enthusiastic in their support. It is an excellent idea to make friends in this manner with Hornby Train dealers, for often they are able to give extremely useful advice and valuable assistance.

Branch Notes

ELLESMERE (DULWICH).—The Branch locomotives and rolling stock have been put in order for the winter session. Distant controlled signalling has been attempted and excellent results obtained. Visits have been paid to the New Cross Telephone Exchange and the Battersea Locomotive Running Sheds. Branch roll: 9. *Secretary:* N. R. Rice, 32, Elsie Road, East Dulwich, S.E.22.

PLYMOUTH (ST. BARTHOLOMEW'S).—An interesting visit was paid to the Millbay Docks and members were fortunate enough to witness the arrival of a liner. Several Pullman coaches waiting to take passengers to London were inspected, and provided an added thrill to the excursion. Another visit has been paid to the Burrator Dam and Plymouth Reservoir and a visit to the Friary Engine Sheds (S.R.) has been planned. Debates are a prominent feature on the programme, and the following subjects have already been discussed: *"Is Air Transport superior to any other form of Transport?" "Are Electric Model Railways better than Clockwork?" "Hornby Trains v. Meccano as a Hobby."* Branch roll: 45. *Secretary:* Kenneth Wills, 8, Beechwood Avenue, Mutley, Plymouth.

CHISWICK.—A local Hornby Train and Meccano dealer has very kindly allowed the Branch to use the basement of his shop, and has installed electric light for their use. A permanent track is being laid down and when this is completed official appointments will be made. Branch roll: 17. *Secretary:* Cyril P. Griggs, 25, Elliott Road, Chiswick, London, W.4.

SPRINGBOIG, GLASGOW, E.2.—Meetings have been resumed in Shettleston Station Waiting Room. Visits to local engine sheds are being planned and it is intended to pay a friendly visit to the Hyndland (Glasgow) Branch during the month. Branch roll: 9. *Secretary:* David C. Ross, 86, Hermiston Road, Springboig, Glasgow, E.2.

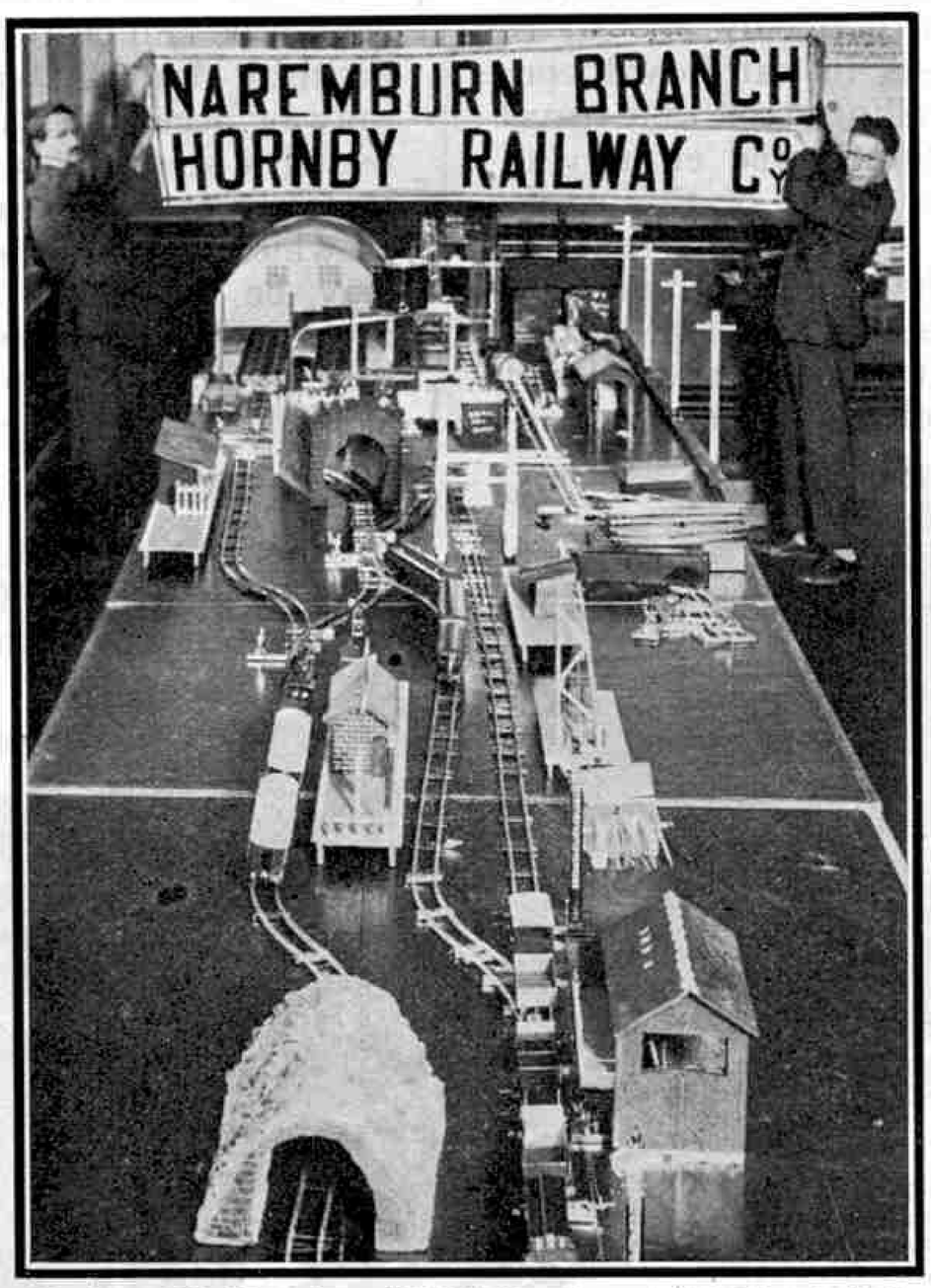
SUTTON AND DISTRICT.—Experiments have been carried out with timetable working. Several new appointments have been made, these including a Superintendent of the Line and a Signalling Superintendent. Subscriptions have been increased in order that a Branch Library may be established. Members hope to visit the Epsom Signal Boxes. Branch roll: 9. *Secretary:* B. H. Dicker, 24, Crossways, Sutton, Surrey.

BROOKFIELD (WIGTON).—The first meeting of the winter session was devoted entirely to business matters. A debate on the relative merits of the L.M.S., L.N.E., and G.W. Railways was held at the end of the second meeting. The L.N.E.R. secured the vote by a narrow margin. Accessories made in the school workshop have increased the realism of the Branch layout. In future it is intended to devote one evening each month to the reading of H.R.C. news in the *"M.M."* Branch roll: 14. *Secretary:* J. M. Lister, "Brookfield," Wigton, Cumberland.

1ST CROYDON (ADDISCOMBE) WOLF CUBS.—An interesting and instructive visit was paid to Devonport Dockyard, and members were allowed to go over H.M.S. *"Renown."* Branch roll: 15. *Secretary:* Mr. K. W. Nottle, "Capri," 3, School Road, West Wickham, Kent.

AUSTRALIA

NAREMBURN (N.S.W.).—Plans have been drawn up for a large outdoor track to be used during the summer months. A steel bridge carrying two-way traffic has been erected, and electric indicators have been installed in order to facilitate the starting of trains. Great excitement was caused at one meeting by the Chairman's presentation to the Branch of a Metropolitan Electric Train Set. Double banking and fly shunting have been practised, and a very satisfactory system of hump shunting has been installed. The Hornby Control System is a very prominent feature of the Branch. The Branch entered a Hobbies Competition held at the Sydney Y.M.C.A., and their Model Railway Layout was awarded the Pennant presented to the best exhibit on view. Branch roll: 11. *Secretary:* Ronald Pauling, 8, Glenmore Street, Naremburn, N.S.W., Australia.



Members of the Naremburn (N.S.W.) Branch preparing a Hornby Train layout entered in the Hobbies Competition of the Sydney Y.M.C.A. This was awarded the Pennant presented for the best exhibit on view

WESTRALIAN.—The inauguration meeting was an outstanding success. In spite of a terrific gale and torrential rains 19 boys attended the meeting, some of them travelling distances of from 2 to 15 miles. A Board of Directors was elected. Track tests have been carried out on ballasted and unballasted tracks and instruction has been given in planning layouts. Branch roll: 19. *Secretary:* Mr. S. H. Chittenden, 576, William Street, Mt. Lawley, Perth, West Australia.

NEW ZEALAND

NELSON.—A large outdoor track has been laid down for the use of the Branch. The system is operated strictly to timetable and is correctly signalled throughout. A library is being started. Branch roll: 38. *Secretary:* Frank Curran, 9, Wainui St., Nelson, N.Z.

Further Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation and any boys who are interested and desirous of linking up with this unique organisation should communicate with the promoters, whose names and addresses are given here. All owners of Hornby trains or accessories are eligible for membership and the various secretaries will be pleased to extend a warm welcome to all who send in their applications:—

BIRMINGHAM—Philip Avins, 72, Bond Street, Stirchley, Birmingham.

CORSTOPHINE—Francis Spaven, 34, Hillview Terrace, Corstophine, Edinburgh.

CROYDON—M. Nunn, 23, Warrington Road, Croydon, Surrey.

EBCHESTER—I. Bewley, Chelmsford Hotel, Ebchester, Co. Durham.

LEATHERHEAD—T. Barfett, St. Johns School, Leatherhead, Surrey.

LEEDS — Edward B. Barnes, 43, Methley Drive, Chapel Allerton, Leeds.

LONDON, S.W.4—E. S. T. Robinson, 37, North Side, Clapham, London, S.W.4.

LONDON, S.E.5—L. G. Butler, 46, Smith Street, Camberwell, London, S.E.5.

LONDON, S.E.27—W. H. Bugg, 80, Wolfington Road, West Norwood, London, S.E.27.

NORTHIAM—David G. Thorpe, "Sparks," Northiam, Sussex.

PENDLETON—B. Gardner, 11, Prestwood Road, Pendleton, Salford.

STOCKTON-ON-TEES — Mr. Norman Middleton, 14, Victoria Avenue, Norton Hill, Stockton-on-Tees.

SWANSEA—L. T. Levitt, "Alpha House," Townhill Road, Sketty, Swansea.

WESTBURY—Robert Hughes, 91, Warminster Road, Westbury, Wilts.

WIGTON—J. E. Connolly, Palace Cinema, Wigton, Cumberland.

WITHAM—Avon Lucking, 49, Bridge Street, Witham, Essex.

OVERSEAS

NEW ZEALAND—W. Scully, 118, Venus Street, Georgetown, Invercargill.

Further H.R.C. Incorporated Branches

77. STREATHAM—C. N. Buller, 21, Rustic Avenue, Mitcham Lane, Streatham, London, S.W.16.
79. PORTSLADE-BY-SEA—H. G. J. Flowers, 38, St. Aubyns Road, Portslade-by-Sea.
80. WILLASTON (PREPARATORY) SCHOOL—John Wood, "Glenhurst," Wistaston, Nantwich.
81. TOWN AND COUNTY SCHOOL (NORTHAMPTON)—Bernard S. Godfrey, 46, Baring Road, St. James', Northampton.

OVERSEAS

76. WESTRALIAN—Mr. S. H. Chittenden, 576, William Street, Mt. Lawley, Perth, Western Australia.
78. GEELONG (VICTORIA)—Colin Aldridge, 65, Kilgour Street, Geelong, Victoria, Australia.

MEMBERS OF THE H.R.C. ARE ENTITLED TO WEAR THIS BADGE WHICH IS BEAUTIFULLY ENAMELLED IN COLOURS

Hornby Railway Company

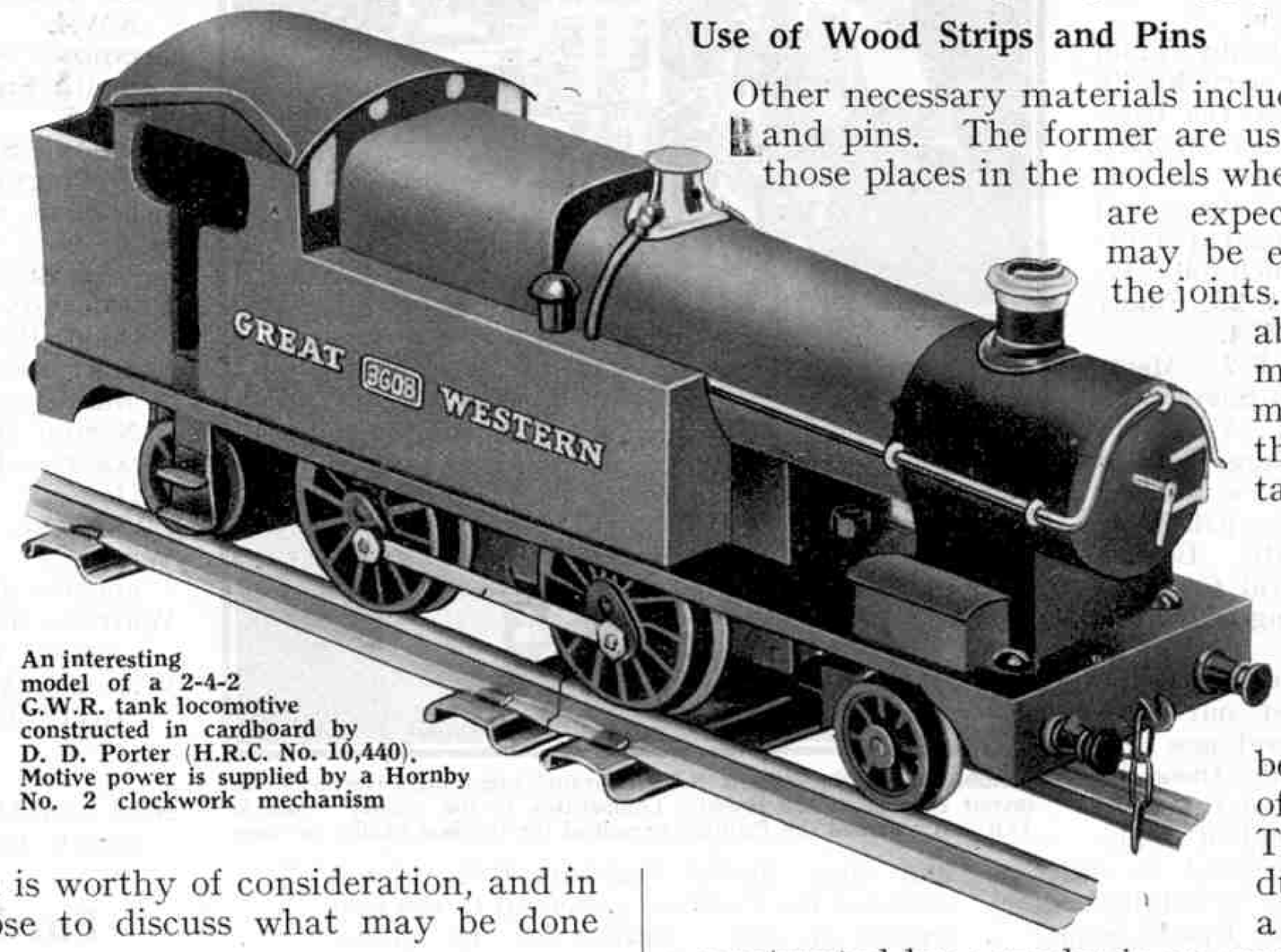
JUNIOR SECTION

XII.—Cardboard in Model Railway Construction

MEMBERS OF THE H.R.C. ARE ENTITLED TO WEAR THIS BADGE WHICH IS BEAUTIFULLY ENAMELLED IN COLOURS

ON page 408 of the "*M.M.*" of this year, we published a description and photographs of an interesting model railway system constructed by Mr. M. B. Flanders, a reader who specialises in cardboard construction. The locomotives and rolling stock that travel on his remarkable railway are constructed entirely of cardboard, even the wheels being made of this easily obtained material. The system suffers from the disadvantage that the locomotives have no motive power and must be pushed along the rails, the owner preferring to "drive them himself," and thus enjoy the thrills of signal checks, permanent way slacks and speed restrictions in exactly the same manner as a real driver.

The idea of taking personal charge of a locomotive as it careers round the track is not one that appeals to every model railway enthusiast, for many of whom the fun of the thing would be spoiled completely if their locomotives did not run under their own power as real engines do. But the suggestion to make use of cardboard in building up or extending a model railway system is worthy of consideration, and in this article we propose to discuss what may be done in this direction.



An interesting model of a 2-4-2 G.W.R. tank locomotive constructed in cardboard by D. D. Porter (H.R.C. No. 10,440). Motive power is supplied by a Hornby No. 2 clockwork mechanism

Suitable material with which to work is easily obtained and its cost is very low. In many cases indeed it would cost nothing, for often ordinary cardboard boxes are composed of board of good quality. If this is used, however, care must be taken to ensure that there are no permanent warps or bends in it.

How to Cut and Work Cardboard

A very great advantage of the use of cardboard is that very little difficulty is experienced in working with it. The use of scissors for cutting is not advised. A sharp knife gives a much cleaner cut, does not spoil the edge of the card, and with it work may be carried on more speedily. A good straight edge also is required and for this a Meccano girder is quite suitable. For cutting along curved lines it may be necessary to make use of scissors, but with judicious handling they will produce quite a good result, and fine sandpaper may be used to clean up the rough edges of the cardboard.

In the construction of models too much emphasis cannot be laid on the importance of careful planning and accurate drawing, and those who set out to construct railway accessories from cardboard should make good use of a steel rule and a set square. Care should also be taken to have reasonably large overlapping surfaces, on which to paste the adhesive used, in order that joints may be made as firm as possible. As an adhesive Seccotine may be recommended, for it makes very strong joints and as it is supplied in a tube, it has the advantage of being extremely easy to apply exactly as required.

Use of Wood Strips and Pins

Other necessary materials include thin strips of wood and pins. The former are used to add strength to those places in the models where stresses and strains are expected, while the pins may be employed to reinforce the joints. Fine short pins suitable for this purpose may be obtained from most drapers. In using them care should be taken to prevent making unsightly ridges that reveal their presence and ruin the effect of the model.

Surprisingly realistic results may be obtained by the use of these simple materials. The illustration reproduced on this page of a cardboard locomotive constructed by a reader is an excellent example of this. At first glance a locomotive does not appear to be the most suitable of subjects for cardboard modelling, but the maker of the model illustrated has handled his materials with great skill. The engine frame is constructed of wood $\frac{1}{8}$ in. in thickness in order to provide the necessary strength. Standard boiler fittings are used and the top feed pipes encircling the boiler on each side of the safety valve casing may clearly be seen. Except for the frame the whole of the bodywork of the model is of cardboard. Its maker has introduced a surprisingly large amount of detail, this including mushroom-shaped air-vents on the tanks and tool boxes at the sides of the smoke-box.

A realistic effect has been given to the model by painting it in correct G.W.R. green, and by finishing the chimney cap and the safety valve to represent copper and brass respectively. The motive power is provided by a Hornby No. 2 Clockwork mechanism, and the

model takes its turn with locomotives of ordinary construction in working the regular train services that are run over its maker's model railway.

Simple Lineside Structures

Before attempting to construct an elaborate model of this kind the junior model railway enthusiast is advised to build simpler lineside structures. For instance, he may select a plate girder bridge as an accessory that will make an interesting addition to his resources. This is quite a common type of bridge, and may be used equally well as an over-bridge or an under-bridge. For model railway purposes the former usually is to be preferred, for it need merely span the line. On the other hand the erection of an under-bridge necessitates raising the track in some manner, and unless the layout on which it is to be used is permanent, and the bridge is a feature of the "landscape," this is not easy to manage satisfactorily.

The span of the bridge naturally depends on whether the line it crosses has a double or single track. Even if the line is single it is better to make the span of the bridge sufficiently large to cover a double track in order to prevent the structure from having a bunched-up appearance. It also should not be forgotten that later a double track may be laid down, and in that event the construction of a wider bridge now will make the change-over easier.

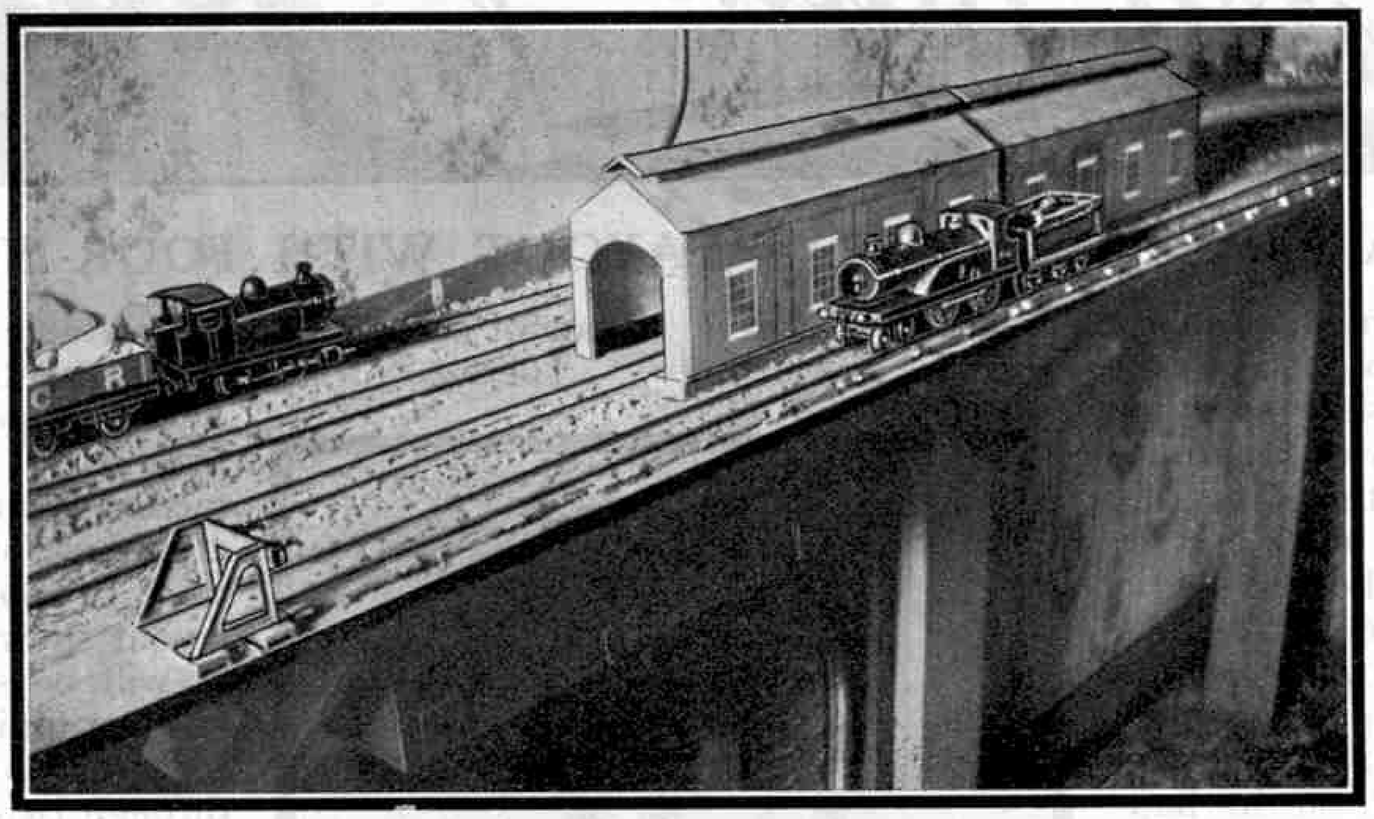
It is not necessary to give detailed designs for a plate girder bridge of this kind, for most readers are capable of planning a structure to suit their own layouts.

A Realistic Engine Shed

Another excellent subject for a cardboard model is an engine shed. An example of this is illustrated on this page. This is a building with a realistic appearance and is large enough to house the two Hornby locomotives shown.

The industrious owner of a layout also may construct a model factory complete with chimney, or a shed in which to store merchandise that has been unloaded from goods trains, or is waiting despatch by rail. Other lineside features that may be built in this manner include wayside stations, or extensions to an already existing terminal station. Many possibilities no doubt will suggest themselves to keen users of model railways. One point that should not be overlooked is that cardboard is cheap and consequently changes in the layout may frequently be made. The opportunity of extending or altering a layout at little cost will be seized eagerly by those who wish to extract the last ounce of interest and fun from their hobby.

When the builder of cardboard models has acquired sufficient dexterity he will be tempted to make his productions more elaborate. As many refinements as choice dictates may be introduced, but detail should not be so fine that it is unable to stand up to the wear and tear experienced on a busy model railway line. Observance of this rule may mean that certain details must be made too coarse or out of proportion. In that case the best plan is to omit or modify them in order to avoid spoiling the effect of the model.



A successful reproduction in cardboard of a model engine shed. This was constructed by C. McLean of Ayr, and provides accommodation for the two Hornby locomotives shown in our photograph

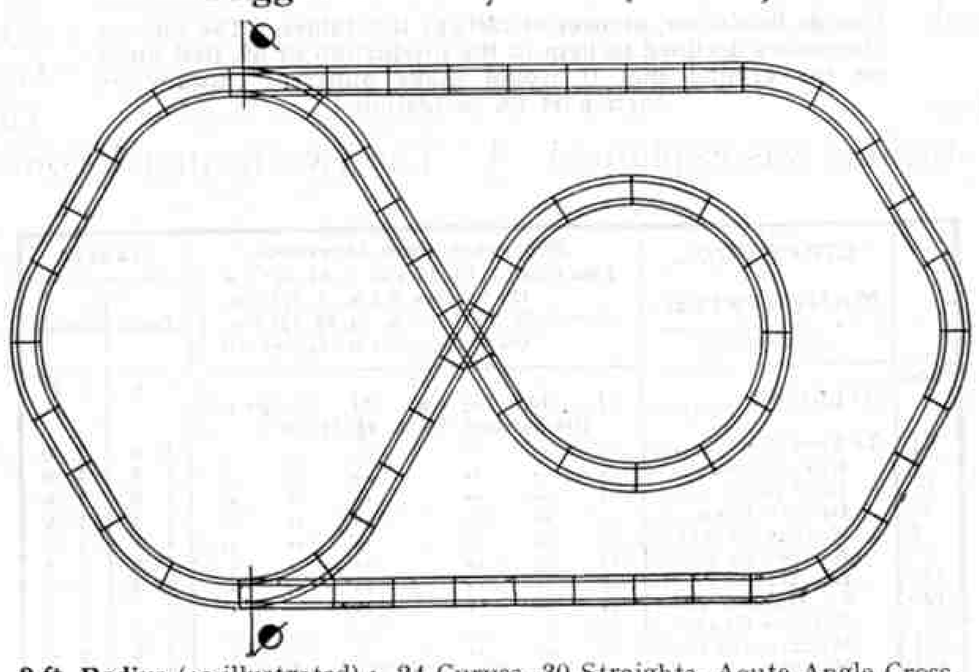
Importance of giving Good Finish to Models

So far we have said nothing about the manner in which a finished appearance should be given to our models. This is done by painting them, and the paint not only gives the required appearance to the structures but is of great value as a preservative, particularly at the joints. If glue is used, in time parts of the model may give way owing to the perishing of the adhesive unless the joints are well covered with paint. If well protected in this manner they will remain good almost indefinitely.

In order to give the correct appearance to a model it often is necessary to give it an enamel finish. For instance, this is the case with models of locomotives, rolling stock, or metal bridges, and it will be found that the use of good enamel will not only enhance the appearance of such a structure but also will stiffen up the model considerably.

For such models as signal boxes and engine sheds an enamel finish is incorrect, and for these the most suitable painting materials to use are "show-card" paints. If these are correctly mixed they give an ideal flat finish. A golden rule is to avoid laying on too much paint, for then kinks and irregularities in the cardboard may develop. A thin even layer is all that is required.

Suggested Layouts (No. 6)



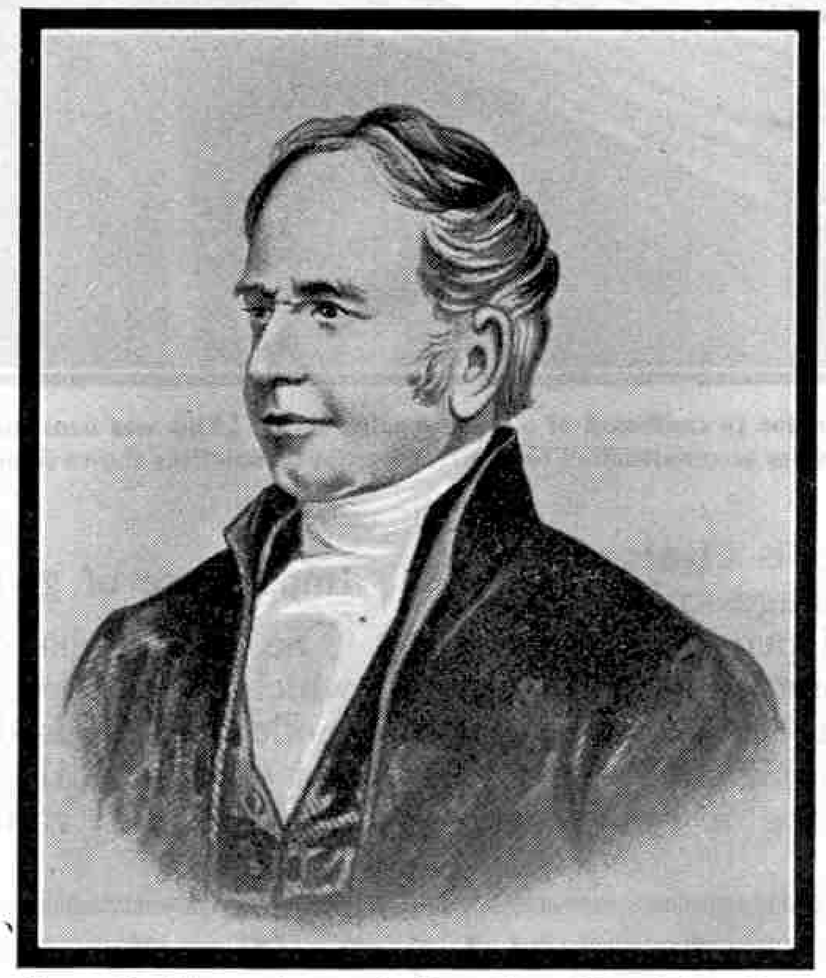
2 ft. Radius (as illustrated) : 24 Curves, 30 Straights, Acute Angle Crossing, R.H. Points and L.H. Points.

1 ft. Radius : 11 Curves, 12 Straights, 4 ¼-Straights, Acute Angle Crossing, R.H. Points and L.H. Points.

XIV.—A TIMETABLE FOR A LAYOUT WITH FOUR STATIONS

THE most interesting time in the growth of a model railway layout probably comes when for the first time the enthusiast runs his trains in accordance with a definite system. It is only then that he begins to realise how much fun he may extract from his hobby.

To run in accordance with system simply means to follow a definite timetable, trains being despatched according to a pre-arranged plan instead of being sent off in haphazard fashion from one point to another. To many railway enthusiasts the mention of a timetable suggests something that is frightfully complicated. There is no reason why this should be the case. Even the most elaborate of model railway timetables is scarcely as extensive as Bradshaw, and the increased interest that a layout derives from the use of a regular system is more than sufficient compensation for the small amount of trouble that may be experienced in working one out.



George Bradshaw, pioneer of railway timetables. The railway companies declined to help in the production of his first guide on the ground that it would make punctual running on their part an obligation !

How to draw up a timetable for a simple layout with two terminal stations was explained in the Junior Section, H.R.C. pages of the March, 1929 *"M.M."* Such a timetable is based on trials made on the track with the locomotives in regular use. With the usual rolling stock behind them, these are timed on journeys over the system. A series of departure times then are arranged, care being taken to allow sufficient time to carry out any movements that may be necessary. It is essential to avoid clashing, and this may be done by noting the positions of the trains at intervals throughout the period for which the timetable is planned. On the simple layout described it is by no means a difficult matter so to arrange the times of leaving opposite terminal stations that collisions cannot occur, or to add suitable passing loops.

There is no reason why timetable working should not be developed on similar lines for use with layouts having intermediate stations, and in the present article we propose to show how this may be done in the case of the layout shown on the opposite page. It will be seen that it consists of two termini A and D, which are connected by a single track passing through two local stations B and C. Both intermediate stations have passing loops, and C also has a siding. In order to work this layout a minimum staff of two is required, one taking charge at each terminal and its adjacent intermediate station.

The first step in preparing a timetable for this layout is to consider the equipment that is available. We will assume that four locomotives may be used, and that these are a No. 2 Special Passenger Tender Locomotive, a No. 1 Goods Tank Engine, a No. 1 Special Tank and a No. 2 Special Tank. The two former locomotives are stationed at D, and the Special Tanks have their home in the engine shed at A.

With these locomotives and suitable rolling stock we may run four kinds of trains in various directions over the track shown. These include express passenger trains, for which the No. 2 Special Passenger Tender Locomotive is suitable ; express goods trains, which will be drawn by the No. 2 Special Tank ; local trains, which stop at every station and are drawn by the No. 1 Special Tank ; and slow goods trains for which the No. 1 Goods Tank will be serviceable.

These trains may make journeys from A to D, or in the reverse direction, either non-stop—as in the case of the express passenger and express

LIVERPOOL TO MANCHESTER.

Departure from Liverpool.
First Class, 7, 8¼, 10 A.M. 2, 4¼, 7¼* P.M.
On Sundays, 8 A.M. 6, 7¼* P.M.
Second, 7¼, 10, 11¼ P.M. 2¼, 6¼, 7¼* P.M.
On Sundays, 7 A.M. 6¼, 7¼* P.M

Miles	STATIONS.	AT	FARES. Inside s d	Outside s d
	LIVERPOOL	7¼, 10, 11¼ A.M. 2¼, 6¼, 7¼ P.M* (On Sundays, 7 A.M. 6¼, 7¼ P.M.*)		
1¼	To Edge Hill	.. ..	1 0	1 0
3¼	Broad Green	.. ..	1 6	1 0
5	Roby Lane	.. ..	1 6	1 0
6¼	Huyton Lane	.. ..	1 6	1 0
8	Huyton Quarry ..	.. ..	1 6	1 0
9	Kendrick's Cross.	.. ..	2 0	1 6
10	Lea Green	.. ..	2 6	2 0
12	St. Helens' Junc.	.. ..	2 1	2 0
13	Collin's Green ..	.. ..	2 6	2 0
14¼	Warrington Junc.	.. ..	3 0	2 6
15¼	Newton.....	By *all* the Trains. Mail 3s. 6d.	3 0	2 6
16¼	Parkside	7¼, 8¼, 10, 11, 11¼ A.M. 2¼, 4¼, 6½, 7¼ P.M (On Sundays, 7 A.M. 5¼, 7¼ P.M.)	3 0	2 6
19	Kenyon Junction.	7¼, 10, 11¼, A.M. 2¼, 5¼, P.M (On Sundays, 7 A.M. 6½ P.M.)	3 6	2 6
21	Bury Lane	.. ..	4 0	3 6
22¼	Flow Moss	.. ..	4 0	3 6
23	Lamb's Cottage ..	.. ..	4 6	3 6
24	Barton Moss	.. ..	4 6	3 6
26½	Patricroft	.. ..	4 6	3 6
27½	Eccles	.. ..	5 6	4 0
28½	Weaste Lane	.. ..	5 6	4 0
29¾	Cross Lane		6 0	4 6
31	MANCHESTER.....	.. .. Mail 6s. 6d.	6 0	4 6

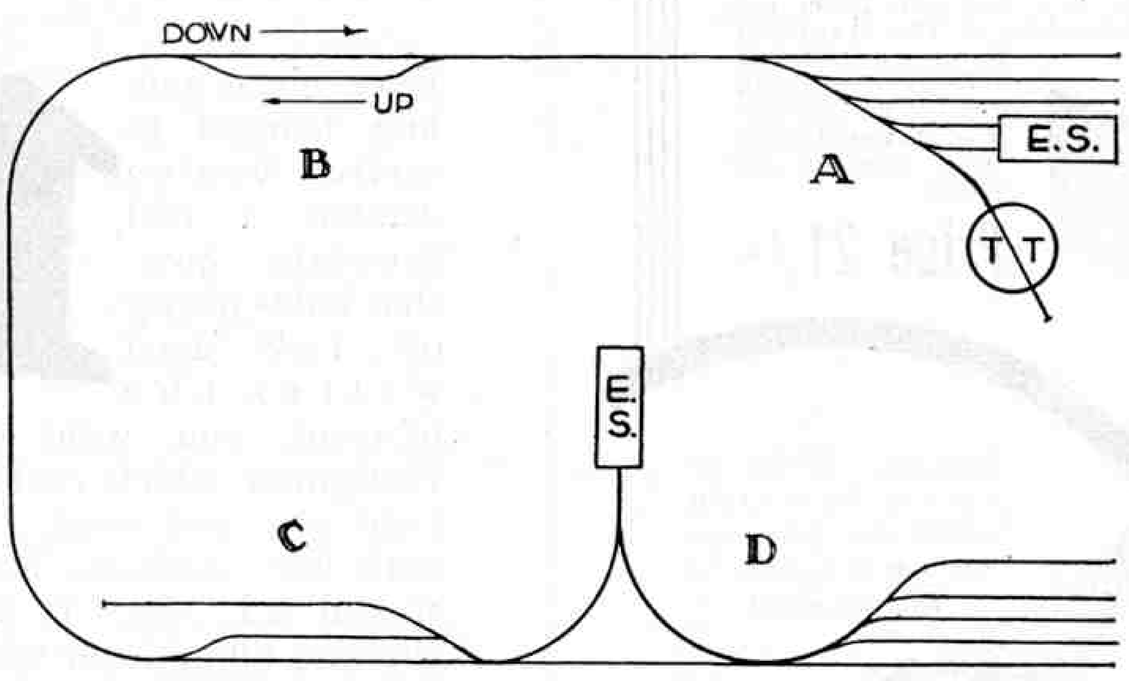
4 Wheeled Carriage £1, 2-Wheeled Carriage 15s ; 1 Horse 14s, 2 Horses 20s, 3 Horses 24s. Children above three, and under ten years half fare. 60lbs. of Luggage allowed with each Passenger, above that at the rate of 3s. ℔ cwt. charged.
* This Train stops at Parkside and Newton only.

Part of a page of the first railway guide published. In the original timetable which appeared in November, 1839, there were only 24 pages, but the "Bradshaw" of to-day contains more than 1,160

goods trains—or stopping at each station on the way in order to pick up or set down passengers, or to unload or load goods. The task before us—an interesting and by no means difficult one—is to arrange a working plan on which to run a series of them.

The first step is to time an actual train on the layout. On the model railway represented by the plan reproduced, the time taken by a train in running from A to B, together with that required to carry out the necessary operations, is half a minute. The timetable therefore is based on half-minute intervals.

It may be thought that half a minute is too small a fraction of time to be recorded, but actually it is very convenient. A fully wound Hornby clockwork locomotive runs for about one minute, and there is no objection to arranging that the distance between the two stations is so short that the locomotives do not run out exactly on arrival, for they may easily be stopped where required by means of a brake rail. It is interesting to note that half-minute intervals actually appear in the working timetables that are followed by the dense traffic entering Waterloo, the London terminal of the Southern Railway.



The layout for which the timetable shown below was planned

As a result of trials of this kind we decide that in the case of local trains half a minute shall be allowed between stations A and B, one minute between stations B and C, and half a minute to complete the journey to terminal D. Express goods and passenger trains take less time over the journey, and a minute and a half therefore is allowed for the former and one minute for the latter.

For ordinary goods trains a slightly longer time allowance is necessary at station C, in order to make provision for shunting into the siding, for the realism of the scheme would be spoiled if trains stopped at the passenger platforms in order to detach or pick up wagons. For this reason the times of departure from C are fixed at two minutes after leaving the previous stations. Thus the total time normally allowed between A and D is three minutes.

UP							
Station	Local	Ex. Pass.	Local	Ex. Pass.	Goods		Ex. Pass.
A. Dep.	8.0	8.7½	8.8½	8.9	8.12½	...	8.17½
B. Dep.	8.0½	...	8.9	...	8.13	...	...
C. Dep.	8.1½	...	8.10	...	8.15	...	...
D. Arr.	8.2	8.8½	8.10½	8.10	8.15½	...	8.18½

DOWN							
Station	Goods	Local	Ex. Pass.	Ex. Goods	Local	Ex. Pass.	Empty Coaches
D. Dep.	8.0	8.3½	8.6	8.11	8.14	8.16	8.19
C. Dep.	8.2	8.4	...	...	8.14½	...	...
B. Dep.	...	8.5	...	...	8.15½	...	...
A. Arr.	8.3½	8.5½	8.7	8.12½	8.16	8.17	8.20

On the basis of these times we then proceed to build up the Working Timetable shown on this page. The arrangement of this differs slightly from the General Working Timetable form already prepared for the use of members of the H.R.C., but is not difficult to follow. The names of the stations appear in the first column, and at the heads of the remaining seven columns are the designations of the trains. It will be noticed that the departure times from the terminals are spread out from what may be described as a "zero" hour of 8.0. The sixth of the series of "up" trains leaves terminal A at 8.17½, and arrives at its destination at 8.18½, while the last "down" train leaves D at 8.19 and arrives at A at 8.20.

During certain periods the track is occupied by only one train. If trains succeeded each other in this manner things would eventually become tame, and certainly would bear little resemblance to actual practice. Fortunately the passenger traffic on our line is very heavy! This makes it necessary to run an "up" local and a second "up" express passenger train immediately after the express that leaves A at 8.7½. These depart at 8.8½ and 8.9 respectively. The second express leaves A only half a minute later than the preceding local train and actually arrives at the terminal D half a minute earlier. Somewhere on the way, then, it must pass the local train, and it is interesting to see exactly how this is done.

Let us imagine that we are passengers on the 8.8½ "up" local. At the head of our train is a No. 1 Special Tank Locomotive that at exactly 8½ mins. past 8 o'clock pulls our coaches slowly out of the station. Rapidly accelerating we rock over the junction, and when clear of the points settle down to a steady speed along the open straight. Soon station B comes into sight and we pull up at the platform.

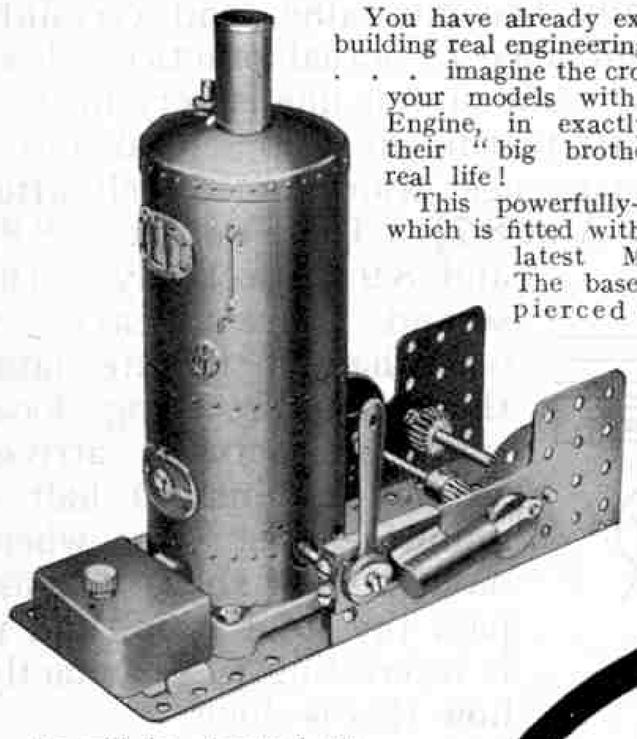
Immediately afterwards our starting signals are pulled off, the guard hustles in the last passenger and blows his whistle, and promptly at 8.9 we set off along the stretch of line leading to station C. Our driver is well aware that behind him the 8.9 express passenger train is thundering along, and is coaxing his locomotive into doing its best. We pull up at station C dead on time, and on looking out of our carriage windows we find that we are no longer on the straight through line that runs on to D, but have been diverted on to a loop line that passes round the other side of the platform. While we are surveying the situation the express passenger train that has been following us roars past on the opposite side of the platform. Careful calculation of the time allowances has enabled us to reach the passing loop at C in time to allow a clear passage to the express.

In this case we have been dealing with one train following another, but operations become even more interesting when trains running in opposite directions pass each other. It is by no means difficult to arrange the timetable in order to allow this to take place, and that worked out for the present layout contains an excellent example that will make the whole process quite clear.

It will be seen that an "up" goods train leaves A at 8.12½ and arrives at D at 8.15½. Turning now to the "down" timetable we find that a local train is timed to leave D at 8.14, and arrive at A

(Continued on page 1014)

Run your models with a Meccano Steam Engine



You have already experienced the thrill of building real engineering models with Meccano . . . imagine the crowning joy of operating your models with the Meccano Steam Engine, in exactly the same way as their "big brothers" are worked in real life!

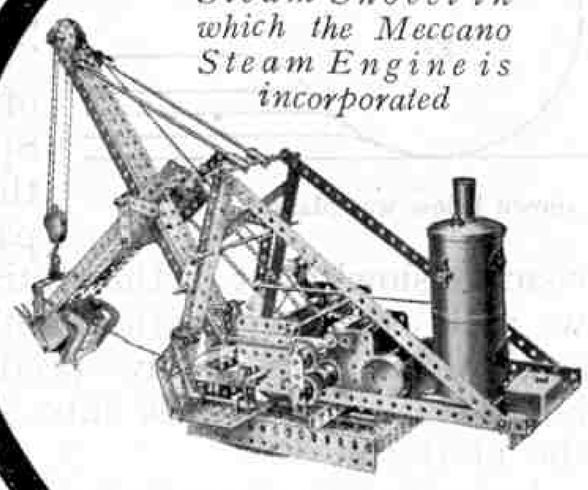
This powerfully-built Steam Engine, which is fitted with reversing gear, is the latest Meccano achievement. The base and side plates are pierced with the standard Meccano equidistant holes, thus enabling it to be built into any Meccano model in the exact position required.

Price 21/-

As will be observed the spirit container for the lamp is placed well outside the boiler casing, eliminating all risk of the spirit becoming heated.

A special Manual, containing full instructions for operating the Meccano Steam Engine and showing 31 Meccano models in which the engine is incorporated, is supplied with each engine.

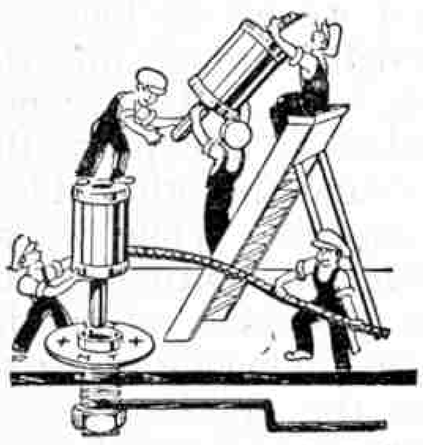
Meccano Model of Steam Shovel in which the Meccano Steam Engine is incorporated



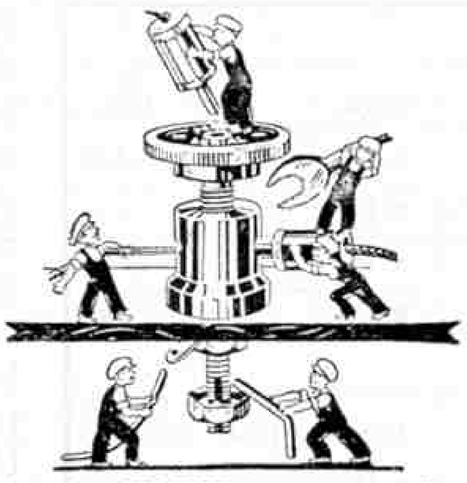
MECCANO LTD.
Old Swan
LIVERPOOL

EELEX

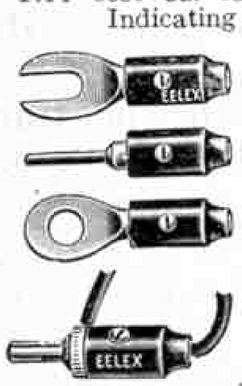
WIRELESS ACCESSORIES



The EELEX gnomes of efficiency illustrate here the adaptability of EELEX Plugs and Sockets with indicating tabs in six colours and forty different varieties. Plugs T.14 cost **3d.** each, Sockets **1d.**, Indicating Tabs **1d.**

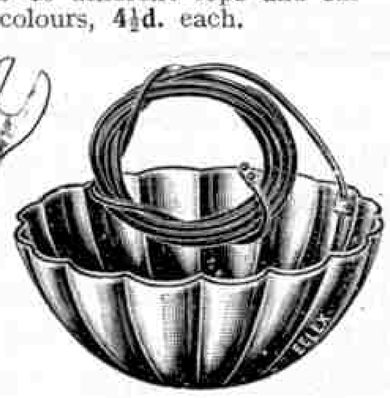


Here the EELEX gnomes are demonstrating the many connections that can be made to an EELEX TREBLE-DUTY TERMINAL. There are 40 different tops and six colours, **4½d.** each.



EELEX Spades, Plugs, Pins, Eyes, and Wander Plugs in 6 different colours. All Nickel Plated finish. **2d.** each.

2 D.W.P. with eye, pin and spade adaptor. **5d.** per set. Plugs in six colours.



Collects and retains all available moisture—improves with age—immune to atmospherical conditions—that is the Eelex "Earth." Supplied with 9 ft. of rubber-covered wire, and connector, for **5/6** each. Postage 9d.

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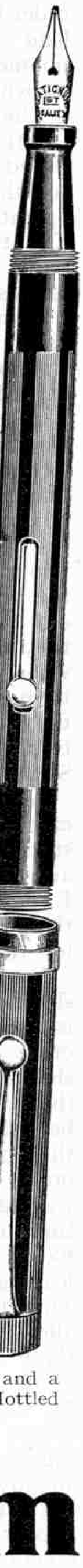
'Phone. : Clerkenwell 9282-3-4.

Make sure you get Platignum Pens this Xmas



Ever since you first learned to write you've wanted a real fountain pen, that holds plenty of ink and writes the moment you want to use it. The Platignum, which costs only 1/3, is the very pen you need. You can have it with fine, medium, broad, oblique or a special A.I. Nib. It has a fixed pocket clip and filling lever which won't tarnish. The nib is strong, writes smoothly, and simply can't go wrong or get corroded. You simply must get a Platignum. They can be obtained in Black or eight lustrous colours.

1/3

INSTANT FLOW DEVICE. This is inside the safety screw cap and seals the nib in air-tight compartment to keep it moist and ready to write.

OTHER PLATIGNUM MODELS

There is also a wide range of larger capacity Platignum pens with larger nibs and superior fittings at 2/6. See these at your stationers, also the new Platignum Desk Set for saving time at your writing table, 5/- complete for fountpen and stand.

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2/6 for this **PLATIGNUM Writing Set**

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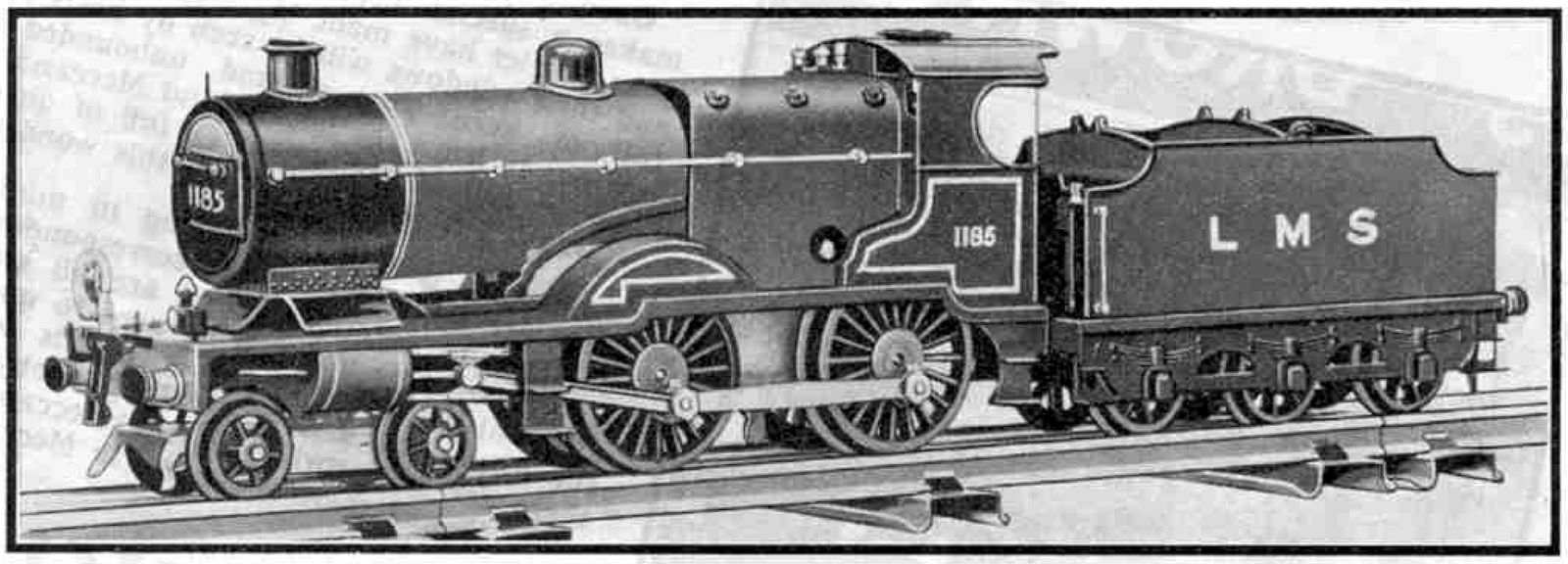
Midland Compounds in the Hornby Series

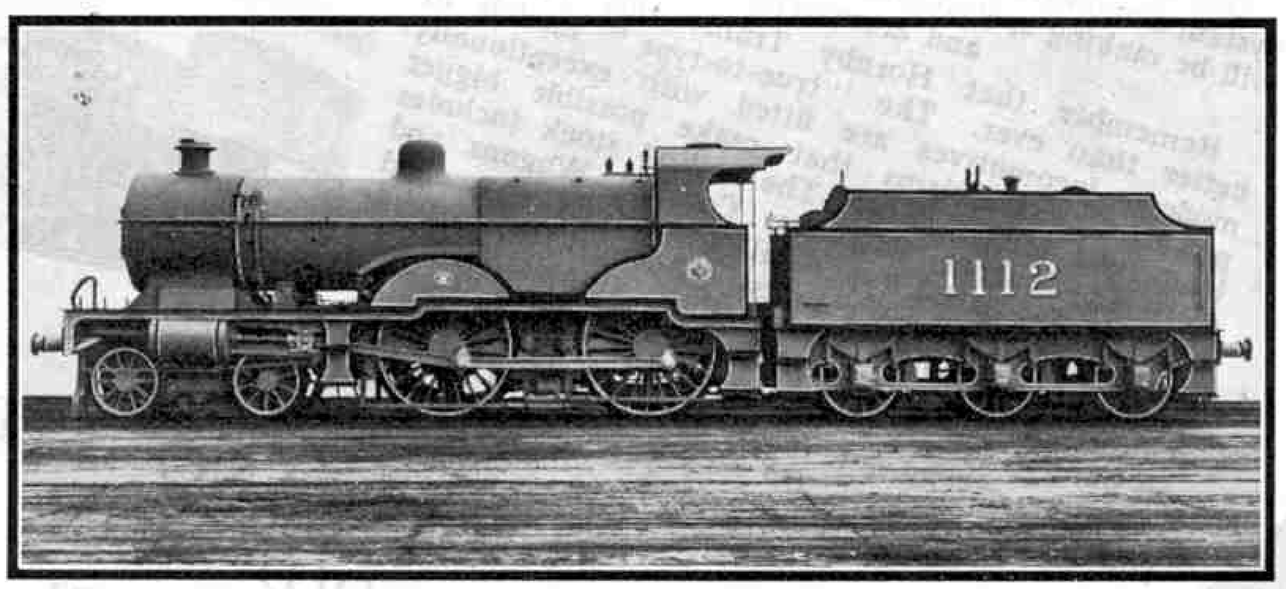
By "Tommy Dodd"

OF recent additions to the range of Hornby locomotives one that is sure to be extremely popular is the model of No. 1185 L.M.S. Standard Compound locomotive that forms one of the No. 2 Special Passenger Locomotives, for the originals of this model have long been favourites among L.M.S. enthusiasts. They were built for use on the Midland Railway and proved so successful that when the grouping of the railway companies took place more were built for introduction over the whole of the L.M.S. system.



The No. 2 Special L.M.S. Hornby Passenger Locomotive and Tender

The Midland Compounds originated in 1902, when two examples of the type were turned out at the Derby Works of the old Midland Railway. They were designed by Mr. S. W. Johnson, then Chief Locomotive Engineer of the system, who built five of them. When Mr. R. M. Deeley succeeded Mr. Johnson as Chief Locomotive Engineer of the Midland Railway, he continued the design, making only slight modifications in order to incorporate patents of his own. At the same time he altered their external appearance. Mr. Johnson's productions had short smoke boxes, and their cabs had narrow roofs and no side pillars. In the later locomotives the roofs were extended rearward, side pillars were added, and generally the engines were given practically the form under which for many years they now have been familiar. The locomotives already existing were renumbered and became the first five of a class of 45 engines numbering from 1000 to 1044.



Our illustration shows a 4-4-0 three-cylinder L.M.S. Standard Compound Locomotive. This is the prototype of the No. 2 Special Hornby Engine above

Many portions of the Midland route were extremely difficult, notably the section from Leeds to Carlisle. On this hilly route the Compounds did splendid work and proved themselves ideal locomotives for fast trains of medium weight. They established such a reputation for speed and general efficiency that when the grouping took place it was decided to increase their number. To-day 235 of them are in use, the numbers running from 900 to 934, and from 1000 to 1199 inclusive. The newer members of the class have smaller driving wheels and cylinders of larger diameter than those of the original design, and thus their nominal tractive efforts are somewhat greater.

When the Midland Compound locomotives were introduced in the Western Division of the L.M.S., they were regarded with prejudice and suspicion, but as soon as the men had learned how to get the best out of their new charges they were loud in their praises of the "Crimson Ramblers," as the locomotives came to be called.

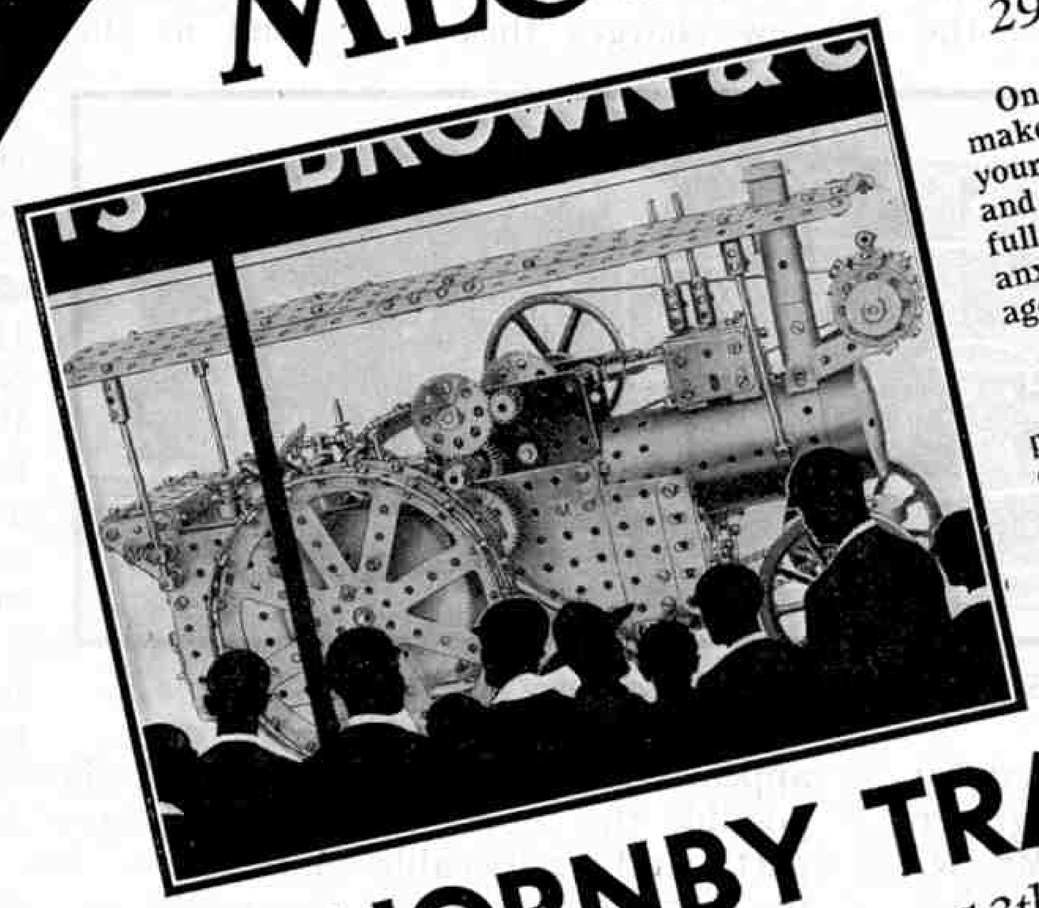
The new Hornby L.M.S. No. 2 Special Passenger Locomotive is a splendid reproduction in miniature of the Standard L.M.S. Compound, and will appeal strongly to all L.M.S. enthusiasts, for as far as possible the model is correct in every detail. This is particularly noticeable in regard to the footplate and the splashers, those of the model exactly reproducing those of its prototype. In addition, the outside cylinders have tail rod guides showing close similarity to those of the original locomotives, while the true-to-life Ross-pop safety valve, the whistle, and the ventilator on the cab roof help to give a splendidly realistic appearance to the model. Vacuum pipes are fitted on both engines and tender. A feature of special interest is the use of detachable lamps, for by placing these on the brackets provided users of this splendid model may make use of the code of signals used on real railways to denote types of trains.

The tender calls for special attention, for it has a very handsome and attractive appearance and, as a glance inside reveals, it is correctly fitted throughout. In it there is a realistic coal slide and the water tank is provided with a filler and a pick-up dome. Even the vent pipes through which air escapes when water is being scooped from track troughs is not omitted, very neat representations of these being fitted. The general appearance of both locomotive and tender is improved by neatly designed handrails, and the steps and brake handles of the originals are reproduced in a realistic manner.

Two big events!

MECCANO WEEK!

29th November to 6th December

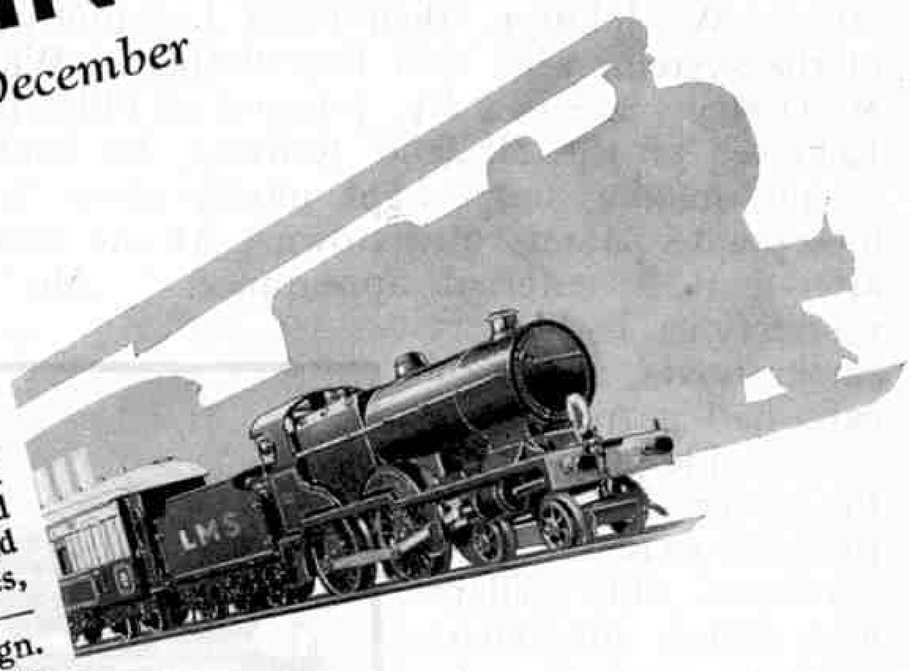


Once a year, during Meccano Week, every dealer makes a special display of Meccano. The dealers in your district have made big preparations for this week, and their windows will be seen by hosts of eager boys, full of keen interest and unbounded enthusiasm, anxious to learn the latest about Meccano. Boys of all ages . . full of excitement . . full of questions . . are wanting to know all about this wonderful hobby.

Meccano is real engineering in miniature—all the parts are miniatures of the corresponding parts in real engineering practice. They are all standardised and interchangeable and can be used to make hundreds of different working models. That is why Meccano is the finest and most enthralling hobby in the world—there are new thrills for the Meccano boy every day and there is no end to Meccano fun.

HORNBY TRAIN WEEK!

6th to 13th December



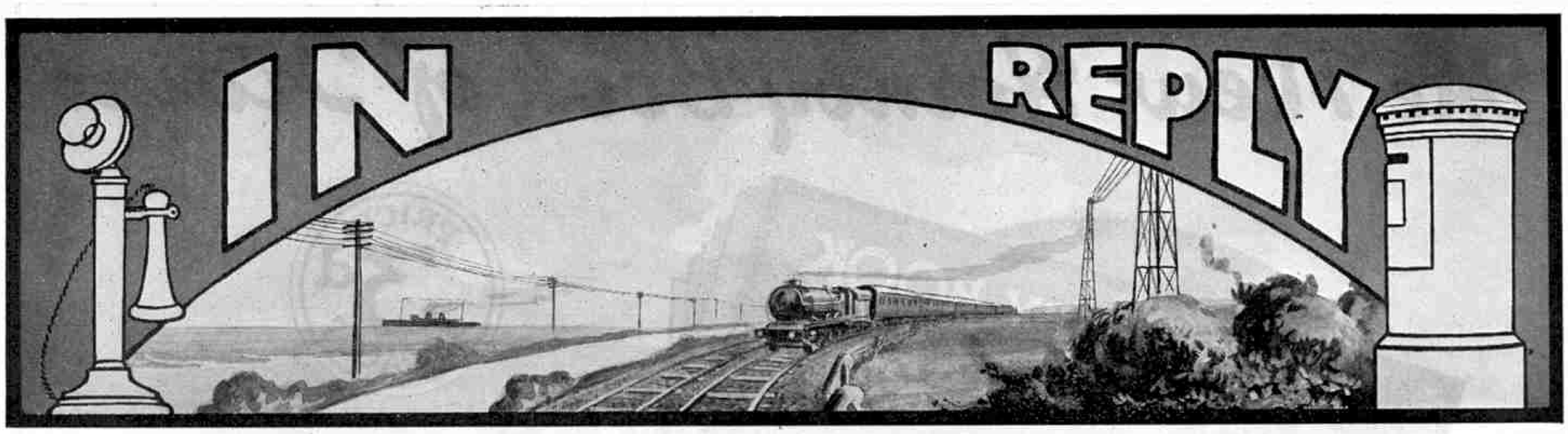
This is the best time to see the Hornby Railway System demonstrated, for this week dealers everywhere will be making special displays of these famous trains and accessories.

Remember that Hornby Trains this year are better than ever. The "true-to-type" models of modern locomotives are fitted with exceptionally powerful mechanisms that make possible bigger loads and longer runs. The rolling stock includes Pullman Coaches, Passenger Coaches, Wagons and Vans of the latest types—all beautifully enamelled in the correct railway colours. Amongst the splendid range of accessories are Stations, Signals, Bridges, Tunnels, Level-crossings, Turntables, Engine Sheds—all built in perfect proportion and realistic in design. Make a careful note of the dates and take Dad with you to *your* dealer. On no account miss this great railway week.

MECCANO LTD.
OLD SWAN
LIVERPOOL

MECCANO WEEK
29th November
to 6th December

HORNBY TRAIN WEEK
6th to 13th December



Suggested Hornby Train Improvements

PLATELAYER'S HUT.—You will be interested to know that we propose to introduce a platelayer's hut in the near future and we are now considering the most suitable type. (*Reply to T. Settle, Fleetwood*).

VEHICLES WITH SIX-WHEELED BOGIES.—It is not likely that we shall introduce vehicles of this type. We would point out that modern practice usually favours the four-wheeled bogie of long wheelbase and our present Pullman Cars follow out this practice. (*Reply to R. Parker, Sunderland*).

IMITATION COAL STACKS.—We do not think there would be sufficient demand for imitation coal stacks to justify our introducing them. Such stacks are easily made at home by gluing small pieces of coal on to a cardboard structure of suitable size. (*Reply to G. Williams, Barmouth*).

MINIATURE FIRE-HOSE BOX.—Your suggestion for the introduction of a miniature fire-hose box is certainly very interesting, but we doubt whether there would be much demand for it. We will bear this suggestion in mind, however. (*Reply to C. Lawrence, Cromer*).

REBUILT "CLAUGHTONS."—We are afraid that it is unlikely that we shall introduce a model rebuilt "Claughton" in the Hornby Series, even though we share your enthusiasm for the prototype. These engines would only appeal to L.M.S. enthusiasts. (*Reply to F. A. Long, Rugby*).

"FROELICH" RETARDING SYSTEM.—There are several difficulties in the way of including this interesting mechanical device in the Hornby System. Even if the wagons used in shunting are fitted with die-cast wheels, there is difficulty in making them run far enough in marshalling operations, owing to the light weight of model wagons and disproportionate friction. The question of the use of a retarding mechanism hardly arises, therefore. We might, as you suggest, consider the application of some such apparatus in order to bring trains to a gradual stop. (*Reply to D. Chatterton, Newark*).

POINTS WITH LEVER ON INSIDE OF CURVE.—Points such as you describe can be obtained by placing a special order with your dealer. (*Reply to A. Knight, Durham*).

LARGER RADIUS CURVES.—Your suggestion that we should introduce curved rails of the same radius as the present outside rail of our double track is an interesting one and will be kept before us for consideration. Should any decision be reached, an announcement will be made in the "*M.M.*" (*Reply to J. O'Rourke, Derby*).

LONGER PULLMAN CARS.—We hardly agree with your suggestion that it would be an advantage to lengthen our Pullman cars. They might perhaps look better, but serious difficulties occur when it is attempted to run scale-length vehicles round small curves. Furthermore, the appearance of a train of such coaches on a curve would be extremely ugly, owing to the very angular positions they would take up. (*Reply to T. Chambers, Ashford*).

BAGGAGE VAN FOR BLUE TRAIN.—We have had very few requests for such a vehicle, and we do not think there would be any demand for it. (*Reply to F. Hart, Dover*).

WATER TROUGHS.—Your suggestion that we should die-cast water troughs in sections is interesting. We presume you mean dummy troughs, as the presence of water would be undesirable. We will keep your idea before us, but meanwhile we suggest that you use a strip of wood planed to a suitable section and painted to represent a water-filled trough. (*Reply to D. Rogers, Gillingham*).

L.M.S. (L. & Y. SECTION) "BALTIC" TANK LOCOMOTIVE.—We are not likely to introduce a model of these locomotives in the Hornby Series, as they would only be suitable for L.M.S. enthusiasts. The 4–6–4 type of locomotive is hardly suitable for a model system having 2 ft. radius curves since, although the coupled wheelbase is short, there would be considerable overhang at each end, owing to the extreme length of the engine. (*Reply to R. Gardner, Manchester*).

LARGER STATIONS.—We quite agree with you that the present Windsor Station is rather small, but a larger one would take up a great deal of valuable space that could perhaps be used to better advantage. (*Reply to J. W. Shaw, Wigan*).

"CONTAINERS" AND FLAT WAGONS.—Your suggestion for model containers such as are now used for goods traffic, and the flat wagons that carry them, is certainly up to date and interesting. If we find that there is sufficient demand for these, we will consider their introduction, since they are, as you say, in common use on all four groups. (*Reply to C. Hallam, Dover*).

SIX-WHEELED BRAKE VAN.—A six-wheeled Brake Van made on the frame of the old No. 2 Tender, as you suggest, would no doubt look very realistic, and we are filing your suggestion. (*Reply to G. Cuthill, Cambridge*).

LARGER SIGNAL CABIN.—We quite agree with your view that a bigger signal cabin would look more realistic in connection with an elaborate layout. The great objection to introducing such a cabin is that it would inevitably be costly, and for that reason probably not very popular. (*Reply to N. T. Edwards, Bangor*).

MODEL OF THE "ROCKET."—Your suggestion that we should manufacture a model of the "*Rocket*" is interesting, but we are afraid that there would be little demand for it. Hornby Railway enthusiasts prefer models of up-to-date locomotives. (*Reply to S. Cook, Weybridge*).

PREPARED BALLAST.—We do not propose to introduce ready-prepared ballast, at any rate for the time being. Suitable material may be obtained quite easily from almost any stonemason. (*Reply to F. Melville, Sunderland*).

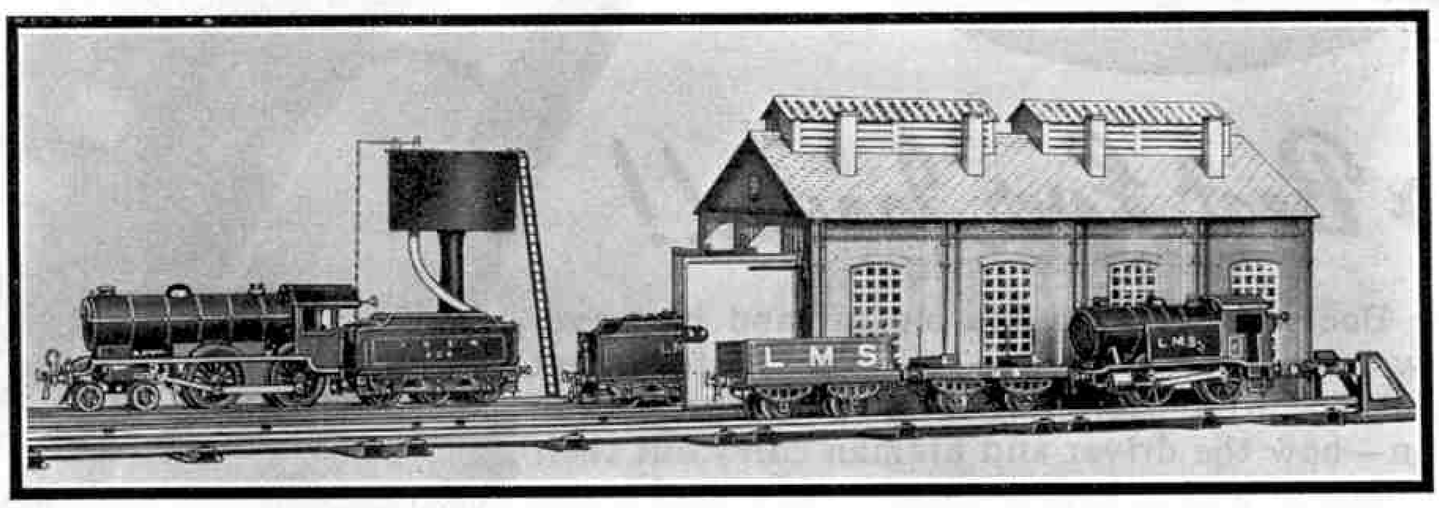
TERMINAL STATION.—It would be very difficult to design a large terminal station that would be of all-round utility, as the requirements of model layouts vary so very greatly. In addition the size of such a station would be a drawback, and the cost would be very high. (*Reply to J. Heaton, Manchester*).

SLEEPING COACHES.—We have had several suggestions for the introduction of sleeping coaches, but we do not favour this innovation. It is not practicable to introduce into a model railway system every type of coach and wagon to be found on real railways. We have to make a selection from the items for which there is a genuine demand. (*Reply to F. Ramsbottom, Birmingham*).

SEPARATE TUNNEL MOUTHS.—We have had several requests for separate tunnel mouths in order that enthusiasts shall be able to construct any length of tunnel for themselves. We doubt if the general opinion of Hornby Railway owners is in favour of such a scheme, but we will keep the idea before us. (*Reply to C. Hodgson, Milnthorpe*).

CATCH-POINTS.—We do not propose to introduce catch-points into the Hornby System; there is hardly any justification for their inclusion in a model railway. (*Reply to L. Miller, Middlesbrough*).

TRAIN INDICATOR.—We are often asked to introduce a model train indicator for station platforms. The difficulty lies in the choice of names of stations, for in this it is impossible to satisfy the particular taste of every model railway owner. We will consider the idea, however, and should any decision be arrived at, an announcement will be made in the "*M.M.*" (*Reply to B. Robinson, Chester*).



Preparing for the day's work! A Hornby "Shire" locomotive "takes in water"

0–6–0 SADDLE TANK.—We frequently receive suggestions for the addition of a 0–6–0 ST shunting locomotive to the Hornby Series. We have not as yet decided to produce one as there is some difficulty in selecting a design sufficiently representative of the practice of each railway group. We will give the idea further consideration. (*Reply to P. Hughes, Newport, and others*).

HORSEBOX.—A horsebox would no doubt be a popular model, and we have had the matter under consideration for some time. (*Reply to J. Ashworth, Broadstairs*).

ARTICULATED COACHES.—Your suggestion for a special bogie to convert our Pullman cars into articulated coaches is very interesting, and you will no doubt be pleased to learn that we are at present experimenting on these lines. (*Reply to C. Lloyd, Ripon*).

STATION ADVERTISEMENTS.—At a later stage we may introduce miniature advertisements for station purposes, and also a newspaper truck. (*Reply to J. Scales, London, S.E.11*).

LONGER WELL WAGON.—A longer well wagon might, as you suggest, look more realistic, but its length would make it very awkward to run on small radius curves. With curves of 2 ft. radius there is a very decided limit to the length of the vehicles that may be employed. (*Reply to S. Sanderson, Preston*).

HIGH-CAPACITY BOGIE WAGONS.—We have had few requests for wagons of this kind, which are not very widely used as yet on British railways. If they become more general in actual practice we shall consider their introduction later. (*Reply to J. Hill, Derby*).

REPAIRS TO HORNBY LOCOMOTIVES.—It is quite feasible to have the repairs you require carried out. A new main spring for your No. 1 Tank would cost 1/7, and a collector shoe, complete, for your low-voltage electric locomotive would be 3/10. Do not send your locomotives to Liverpool, but take them to our London Repair Depot, 5-6, Marshall Street, Golden Square, W.1. (*Reply to G. Watson, London, W.1*).

DIFFICULTY WITH LAYOUT CURVES.—Your trouble in regard to the curves of your layout will disappear if you use more quarter curves. A supply of these, and also of quarter straights, is of very great value when the space available for a layout is very limited (*Reply to S. Hunter, Halifax*).

GUN TRUCK.—Trucks of special types of this nature do not appear to be in any demand, and therefore we cannot consider their introduction. (*Reply to W. Gibson, York*).

The New Hornby Book of Trains

Biggest & Best Ever Issued!

The new Hornby Book of Trains is the biggest and best ever issued. It tells a wonderful story of our railways, a story that will hold you fascinated from beginning to end. Read how a Locomotive is driven—how the driver and fireman carry out their duties—how the permanent way is kept in repair—how mail trains work by day and night—and how four British Expresses have achieved world wide fame.

Then read all about the new " better-than-ever " Hornby Trains with their enormously powerful mechanisms. Full details of all Hornby Train Sets and many beautiful illustrations in colours are included, together with descriptions and prices of all the Rolling Stock, Accessories and Rails in the Hornby Series.

How to Obtain the Book

You may obtain the Book from any Meccano dealer, price 3d., or direct from Meccano Ltd. (Dept. A.M.), Binns Road, Old Swan, Liverpool, price 4½d. post free. If you order direct mention the names and addresses of two or three of your chums and we will send them some interesting Hornby Train literature. Write clearly and be sure to put the letters A.M. after your own name for reference.

Direct orders are not acknowledged. They are dealt with as soon as they are received, and every endeavour is made to send the book to the purchaser by return of post. It is desirable that a remittance in stamps should be sent and also that the name and address of the sender should be clearly written. There is no reduction if more than one copy is ordered.

Orders from Overseas

There is a special edition of the Hornby Book of Trains for Overseas, and copies have already been despatched to our agents to fill orders received. The price Overseas is 6d. post free (Canada 10 cents or 12 cents post free). Readers in Australia, New Zealand, South Africa or Canada who require copies should address their orders to our agencies as detailed below.

Readers living in countries other than those mentioned should order from Meccano Ltd., Binns Road, Old Swan, Liverpool, sending a remittance for 6d. with their order.

AUSTRALIA.—E. G. Page & Co., 52, Clarence Street, Sydney. (P.O. Box 1832K).

NEW ZEALAND.—Models Ltd., Kingston Street, Auckland. (P.O. Box 129).

SOUTH AFRICA.—Arthur E. Harris, 142, Market Street, Johannesburg. (P.O. Box 1199).

CANADA.—Meccano Ltd., 45, Colborne Street, Toronto.

MECCANO LIMITED
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You can get a copy from your Meccano Dealer!

H.R.C. COMPETITION PAGE

Locomotive Name and Number Contest

Competitions appearing on this page are open only to members of the Hornby Railway Company. Envelopes containing entries should have the title of the competition clearly written in the top left-hand corner and should be addressed to the Hornby Railway Company, Binns Road, Old Swan, Liverpool. The name, address and membership number of each competitor should appear in clear writing on every sheet of paper used.

OF the thousands of railway queries of all kinds that pour into H.R.C. headquarters daily, a very large proportion are concerned with the names and numbers of locomotives. In common with all railway enthusiasts, members of the H.R.C. are keenly interested in these, and lose no opportunity of adding to their collection the names and numbers of locomotives seen, or of increasing their general knowledge by making enquiries regarding those of well-known types.

In view of this great interest we have decided to put our readers' knowledge of names and numbers of locomotives to the test. For our competition this month, therefore, we are reversing the usual order of things. We shall continue to submit willingly to a bombardment of questions regarding the number of "*Flying Cloud*," the name of No. 2547 of the "Whatever Is It" Class, etc., but in addition we ourselves intend to become questioners.

The panel that appears in the centre of this page is the result of this decision. Although at first glance there seems to be nothing familiar in the words there reproduced, in reality these are the names of well-known locomotives belonging to one or other of the four groups. The reason of the extraordinary appearance of the names is that the letters have been thoroughly jumbled up, and competitors are asked to arrange these in their proper order.

Some of the names are terrifying in appearance. For instance, this is the case with "Ristclghtnoaueilbrg," which appears in the first column. It seems difficult to believe that the name of any locomotive can contain the extraordinary collection of letters quoted, but this is the case and we have every confidence that the railway knowledge of H.R.C. members will enable them to solve the mystery. The first name on the list is quite easy, and in order to assist competitors we pass on the information that "*Ooraslyct*," when rearranged, becomes "*Royal Scot*." Each of the 48 words given must be dealt with in exactly the same manner. In addition the number must be correctly given. The digits making up the numbers have been jumbled in exactly the same manner as the letters contained in the words.

In writing out solutions the number and word given must be reproduced in addition to the solution. Thus for instance, the first line in the solution should read:

0160 "*Ooraslyct*" = 6100 "*Royal Scot*."

No.	Name	No.	Name
0160	Ooraslyct	7344	Losoria
3532	Wcsoaenb	2140	Bmiiorshnarhct
937	Lkdgreeacnenigo	3729	Ohtbolisnibro
1639	Vviichhnora	39	Tniopdnalrath
5540	Ywncoa	157	Rreeta
1135	Oousssic	6192	Ttiieenncbsad
4028	Eeelvdn	8149	Bmudiieedks
4408	Wyystthrebastelac	5552	Yzbanmtiu
4933	Yonlesse	7614	Rrieouc
058	Nrodlieson	4545	Erihsdnalromtsew
9005	Ristclghtnoaueilbrg	7500	Letsactoougermn
8658	Raat	544	Uueeeeevrinnqg
103	Rinksshsreoi	9253	Nepmeawamnr
2133	Ssoneearb	8951	Aassrotlb
9414	Aauulirc	9082	Diqunemha
844	Rsittrirsma	7823	Fusisret
333	Rereeancmmb	1340	Urmnadmo
475	Ttaenigl	367	Rsideganissrbo
7955	Manislat	9924	Llahreytyog
4165	Oguhrotciv	8463	Eeeediochiltr
5825	Erycart	6425	Oodnnav
4872	Corodola	1049	Llhadonsailb
7803	Nnyekkliytnouc	108	Serlogedtoilemrif
7051	Rarafaltg	397	Lakezontisr

When the list is completed, or when as many correct names and numbers as possible have been filled in, the competitor's name, address and membership number should be written on the sheet, which should be put in an envelope and sent to Headquarters clearly marked "Name and Number Contest" in the top left-hand corner.

The Contest will be divided into two sections—Home and Overseas. Prizes of Hornby goods (or Meccano if preferred) to the value of £1-1s., 15/–, 10/6, and 5/– respectively, will be awarded to the four competitors in each section who submit lists containing the highest number of correct solutions. A number of consolation prizes also will be awarded, and thus no competitor should be deterred from sending in his entry by the fact that he has been unable to find the correct names and numbers in every case. In the event of a tie for any prize neatness will be taken into consideration in making a final decision.

Envelopes should be plainly addressed and must be posted to reach Headquarters at Binns Road, Old Swan, Liverpool, on or before 31st December, 1929. The closing date for the Overseas section is 31st March, 1930. The omission of the H.R.C. membership number from any entry will cause it to be disqualified.

Locomotive Drawing Contest

It is a considerable time since we invited H.R.C. members to take part in a drawing contest, and this month we are giving them an opportunity to show their skill in this direction. The subject of the competition is "*My Favourite Locomotive.*" As usual in this type of contest what is wanted is a "true-to-life" drawing, and in the eyes of the judges accuracy in regard to the important details that make a locomotive efficient will count heavily.

The contest will be divided into the usual two sections—Home and Overseas. Prizes of Hornby Railway material (or Meccano if preferred) to the value of 15/–, 10/6, 5/–, and 2/6 respectively will be awarded in each section.

The words "Locomotive Drawing Contest" should be marked in the top left-hand corner of envelopes containing entries. More than one attempt may be sent in by each competitor, and the name, address, and H.R.C. number of the entrant must appear on the back of each. Closing Dates: Home Section, 31st December, 1929; Overseas Section, 31st March, 1930.

Competition Results

HOME

October "Route-Finding Contest."—First: W. Binns (3347), Blackpool. Second: K. Tomlinson (10007), Poulton-le-Fylde. Third: J. C. Button (10335), Crewe. Fourth: J. Williams (2787), Manchester.

October "My Favourite Railway Station" Competition.—First: L. Garnett (2641), London, S.W.15. Second: D. R. Mirams (9034), Birmingham. Third: J. Everitt (542), London, S.W.16. Fourth: K. Stockley (1685), Preston.

OVERSEAS

August "A Locomotive Knowledge Test."—First: H. D. Webber (8853), Johannesburg. Second: J. F. Dennison (9332), Otago, New Zealand. Third: T. MacLachlan (1965), Otago, New Zealand. Fourth: A. G. Prince (7755), Cloverdale, B.C., Canada.

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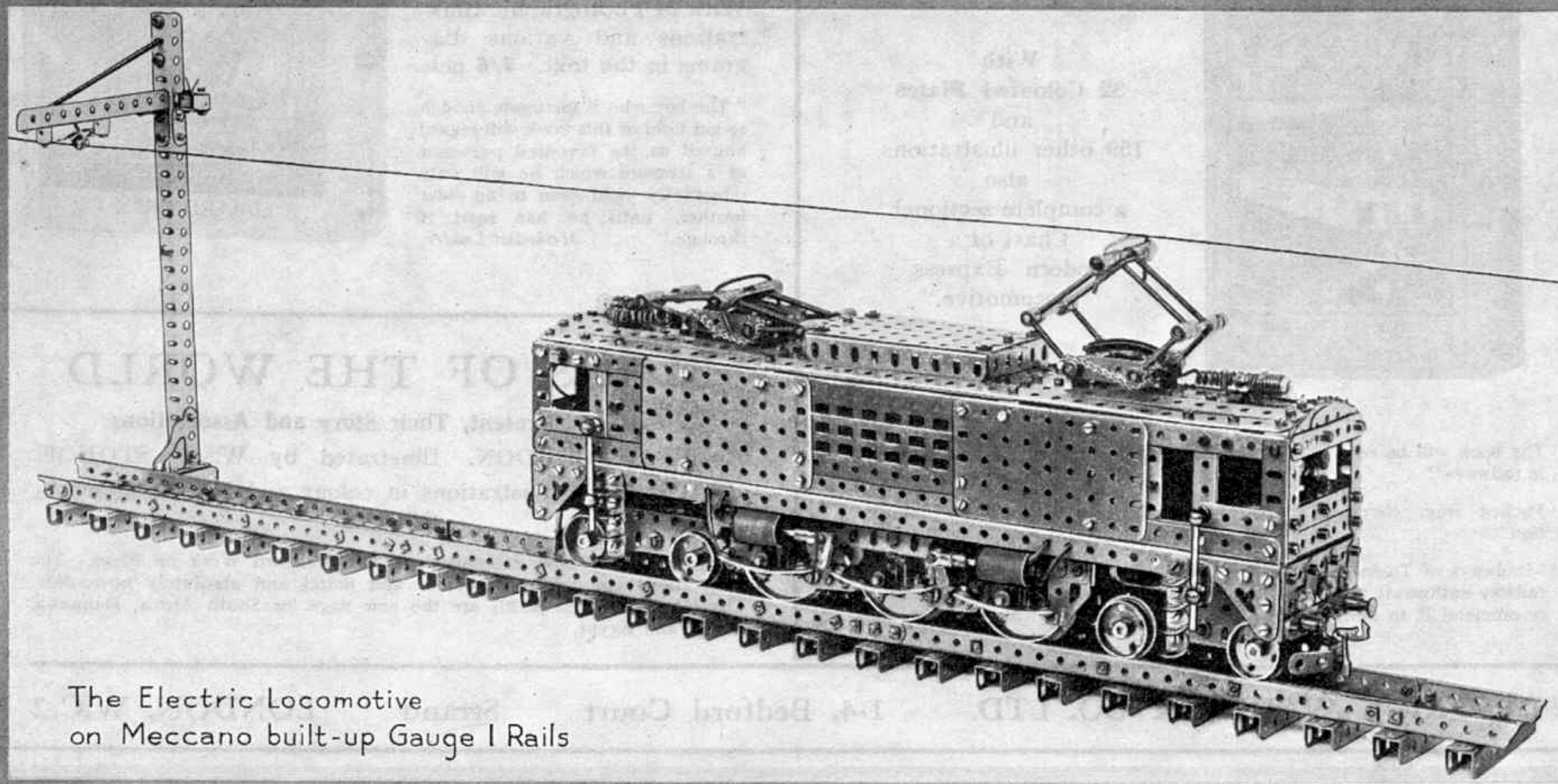

The Electric Locomotive
on Meccano built-up Gauge I Rails

ON this page we illustrate the remarkable Meccano electric locomotive with which H. G. van der Sluis secured First Prize in the Overseas Section of the special Locomotive Model-building Competition held two or three years ago.

The model is undoubtedly one of the most complete and realistic miniature reproductions that have yet been achieved in Meccano. It is built to a scale of 1 : 30 and is designed to run on standard gauge 1 ($1\frac{3}{4}$″) rails. Its length is 20 inches over all, width $3\frac{1}{2}$″ and height above rails (with trolleys locked down) $6\frac{1}{2}$″, thus keeping within the scale dimensions of the American loading gauge, as the model is of the heavy American type. Two old-style heavy current Meccano Motors are fitted, operating the six driving wheels through a gear reduction of 1 : $22\frac{1}{2}$, and the loco has a maximum speed of three miles per hour (equal to 90 m.p.h. in actual practice) when running on 220 volts direct current. It will pull a seven-coach train, weighing about 30 lbs., at a speed of 2 miles per hour.

The weight of the loco itself is 13 lbs. when running on direct current, but the original model as constructed by Mr. van der Sluis was over 14 lbs., for a transformer was fitted inside the loco for lighting the lamps from the 120 volts alternating current which was first employed.

Details of Driving Motors and Transmission

The side members of the chassis are built-up T-girders, $18\frac{1}{2}$″ long, connected at the ends by $3\frac{1}{2}$″ T-girders and reinforced by Corner Brackets, while a floor consisting of Flat Plates covers the whole. Further Corner Brackets, $1\frac{1}{2}$″ Girders and $3\frac{1}{2}$″ Strips form the buffer beams. Each of the two Motors, which are placed on this chassis, drives a 9 : 1 reduction gear and they are connected together by a crank movement built up from $7\frac{1}{2}$″ Strips and Bush Wheels. Between the Motors is another horizontal Rod, also coupled to the crank movement. This Rod is used for transmitting the drive to the centre pair of driving wheels.

Bevel gearing provides three vertical driving spindles, which are journalled in Bush Wheels bolted to the frame plates. At their lower ends are three $\frac{1}{2}$″ Pinions engaging with $1\frac{1}{2}$″ Contrate Wheels on the wheel axles. These wheel axles are journalled in Eye Pieces, the bosses of which are fixed to the leaf springs. The Eye Pieces are free to slide on vertical 2″ Slotted Strips.

The leaf springs are attached by means of Angle Brackets to Trunnions that form part of the chassis. The three springs on each side are connected to each other by compensating levers formed from $1\frac{1}{2}$″ Strips, so that a perfect springing and equalisation of the weight over the driving wheels is obtained under the varying track conditions.

The bogies are connected to the frame by double jointed levers, which leave them free to swivel in all directions. At the same time they actually carry their share of the weight of the loco, owing to an ingenious easily-adjustable ball-bearing device that is constructed as follows : A short Screwed Rod secured in a vertical position to the centre of each bogie carries a 1″ fixed Pulley, and the centre hole of the latter forms a cup to receive a Meccano Steel Ball. This presses against a Flat Plate in the engine-frame, and thus supports part of the weight of the loco. The load may be distributed evenly over the bogies and driving wheels by adjusting the small Screwed Rods (which are mounted in Threaded Bosses) until the correct pressure against the Flat Plates is obtained.

An interesting feature of the model is the electric brake gear. This is operated from four Meccano Bobbins each wound with ten layers of No. 26 wire, and the solenoids so formed are connected in series. When the circuit is completed they attract $1\frac{1}{2}$″ Rods which slide inside the solenoids and are connected by means of a small Fork Piece and a Coupling to two transverse Rods. A further Coupling is mounted by its centre hole on each of the latter in such a way that, as the magnets are brought into action, its ends press outward against the circumference of the driving wheels.

In the driving compartment at each end of the loco a master-controller is provided, giving starting, stopping and braking positions, and four lamp switches. Four lamps illuminate the interior of the loco, and there are three head-lights and a rear light at each end. When the outer lamps are switched on, the three white lights are illuminated at the end where the switch is applied, thereby indicating the front or driver's end, while at the same time the red lamp at the other (rear) end is lit, and vice versa. Three lamps are placed just above each buffer beam.

The realistic overhead current collectors, or pantographs, may be locked down or set up at will, as indicated in the photograph. Four sliding-doors are provided, giving access to the interior of the locomotive.

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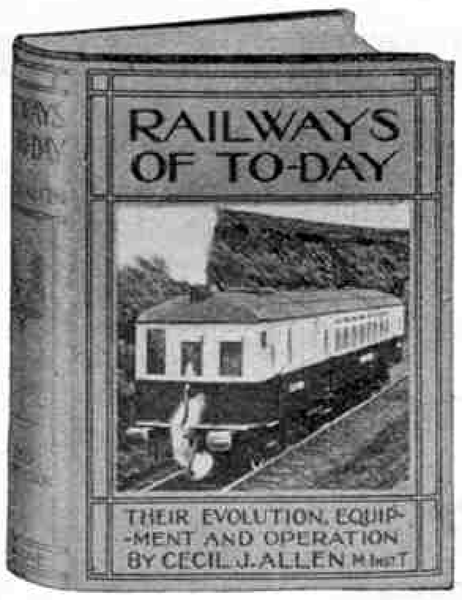

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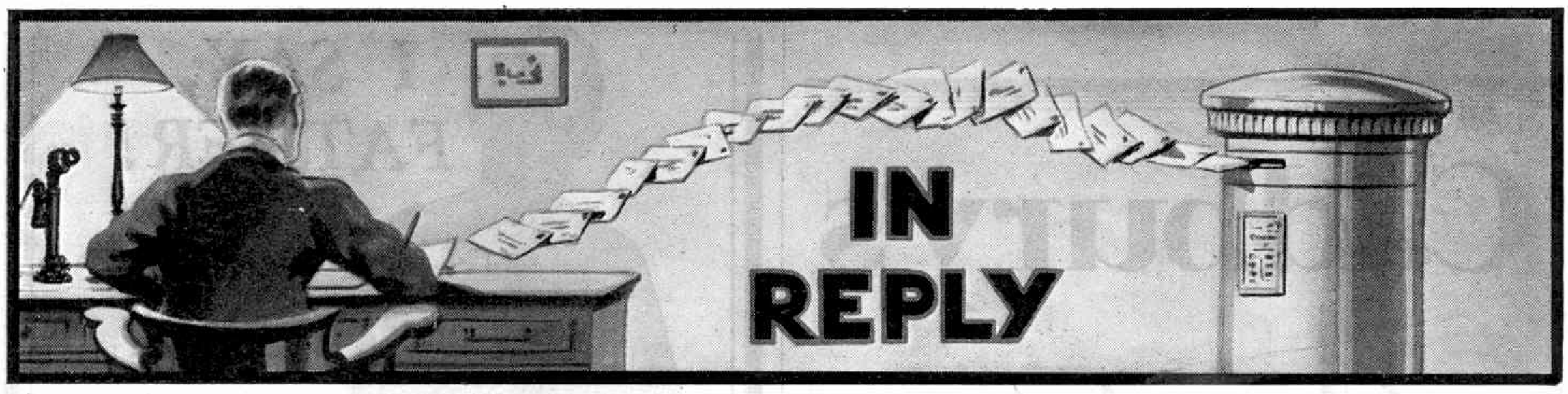


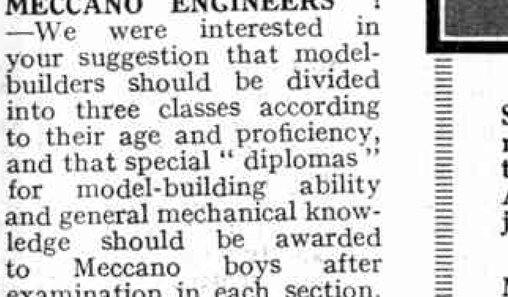
READERS' SUGGESTIONS FOR MECCANO IMPROVEMENTS

"BALL AND SOCKET" JOINT.—Although an ingenious mechanism, we do not consider that we would be justified in introducing a special ball and socket unit for use in the Meccano system, as its range of utility would be very limited. The ball and socket joint, as many readers will remember, received considerable popularity during the early days of wireless, when it was used in the adjustment mechanism of crystal detectors fitted to radio receivers, but this is only an isolated case of the application of the joint to general mechanics. A mechanism that reproduces closely the functions of the ball and socket joint, was incorporated in the model "Siemen's Chronometric Governor," described in the "Suggestions Section" of the May, 1928, "*M.M.*" (*Reply to E. R. Davies, Winnipeg, Canada*).

LARGER LOOSE PULLEYS.—It would not be a sound proposition to introduce 2" and 3" diam. Pulleys without boss and set-screw as these would lack adequate bearing surface when mounted on Rods and would consequently be prone to wobble. There is, moreover, no need for larger pulleys, as the 2" and 3" diam. fast Pulleys can easily be employed as loose ones, by mounting them on a Rod between two Collars. It is only in small and complicated models that the advantage of the absence of a boss in the 1" loose variety is appreciated fully. (*Reply to J. F. Dennison, Stirling, Otago, New Zealand*).

AN "INSTITUTION OF MECCANO ENGINEERS"!—We were interested in your suggestion that model-builders should be divided into three classes according to their age and proficiency, and that special "diplomas" for model-building ability and general mechanical knowledge should be awarded to Meccano boys after examination in each section. The three grades would be as follows: Class 1 for very young boys who would be known as "Students," class 2 for model-builders under 18 years of age, or "Associate Members," and class 3 for those over 18 years who would be known as "Members," or "Master Model-builders." This idea is certainly very ingenious and perhaps readers will let us know their opinions of the scheme? (*Reply to G. Leroy, Calais, France*).

LEVER SAFETY VALVE.—We were interested in your suggestion regarding the new Meccano Steam Engine. As the sketch shows the "lever" valve consists of a seating-piece A secured to the boiler F, into which fits a conical valve B. B is attached to the arm C, which is pivoted at one end to the bracket D, and carries at its other end a slidable weight E that is held in position by a set-screw. The weight E is adjusted so that the cone B is raised, and the steam in the boiler released, when the pressure reaches the limit of safety. We do not propose fitting a valve of this type to the Meccano Steam Engine, however, as the existing spring type valve is perfectly efficient and, moreover, "fool-proof." (*Reply to E. Rose, Slough*).



"SWASHPLATE."—We were interested in your suggestion that we should manufacture a special wheel having its face set obliquely to the boss, for building up the mechanical movement known as the "swashplate." This mechanism, as some of our readers will know, is the outcome of an attempt to convert reciprocating motion to rotary motion with the fewest number of moving parts, and although not used extensively in engineering, it is to be found in such machinery as hydraulic steering gear, turret rotating engines, etc. Readers will be interested to know, however, that the "swashplate" gear has now been reproduced from standard parts, and constructional details of it will appear shortly. (*Reply to R. G. Bridge, Bournemouth*).

CONICAL BEARINGS.—We were interested in your suggestion that specially shaped rod tips and bearing pieces should be introduced for use in delicate Meccano machinery, where friction is to be kept as small as possible. The two parts that you suggest should be introduced, are a metal cone threaded at one end and fitted with a set-screw so that it could be attached to the end of a standard Axle Rod, and also a length of screwed rod having a conical impression cut in it, in which the cone member could fit. This type of bearing for rods is employed in a modified form in the construction of watches, clocks, and other delicate mechanisms. We are doubtful, however, whether a sufficient number of uses could be found for a bearing of this type to justify its introduction, but we hope to consider the idea more fully in the near future. (*Reply to H. Kuenzler, Strasbourg, France*).

2" ARTILLERY WHEELS.—2" artillery wheels would have very few uses if introduced. Where a 2" Wheel is required the 2" grooved Pulley with or without Rubber Tyre can be employed with excellent effect in most models. We are, however, considering introducing a 3" spoked motor car wheel, and we will be able to say something definite regarding this in the near future. (*Reply to F. Marquand, Woodville, New Zealand*).

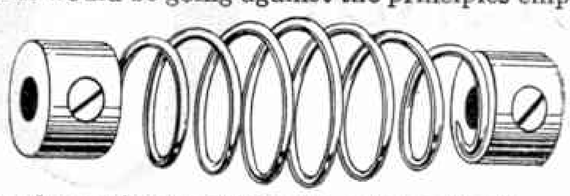
COMBINED GEAR AND PINION.—We note your idea that a combined wheel and pinion should be introduced. We agree that a wheel of this type would somewhat simplify the construction of gear trains, but we would point out to you that this type of unit can quite easily be reproduced by removing the set-screws from a standard Gear and Pinion of the required size, and secure these together by means of Socket Coupling (part No. 171). The gear unit constructed in this manner possesses the advantage that the Gear and Pinion can be used separately when required, which would not be possible with your suggested article. We regret therefore that we cannot give serious consideration to the introduction of this device. (*Reply to J. Tomlinson, Chester*).

SPRING STRIPS.—We note your suggestion that standard Perforated Strips manufactured from tempered or springy steel, should be introduced. These parts would be useful in building up the laminated cantilever and half-elliptic springs for model motor cars, and a number of other uses for flat springs of this type could, no doubt, be found. The only draw-back to these parts is that they would be weak on account of the perforations cut in them, and they would therefore be liable to fracture under any great bending stress. We shall, however, give your idea careful consideration. (*Reply to P. Veys, Vlamertinghe, Belgium*).

NEW TYPE BOILER.—Your design for a suggested new type vertical steam engine boiler is quite interesting, but we do not consider that it would possess any great advantage over the existing Meccano Boiler (part No. 162). As this article is never required to hold water, there would be no point in manufacturing it from brass, and when produced from this material it would be far more likely to suffer damage than the existing Boiler, which is, of course, cut from steel sheet. (*Reply to C. Lamotte, Villers-Bocago, Valvados, France, and F. Yates, Rochdale*).

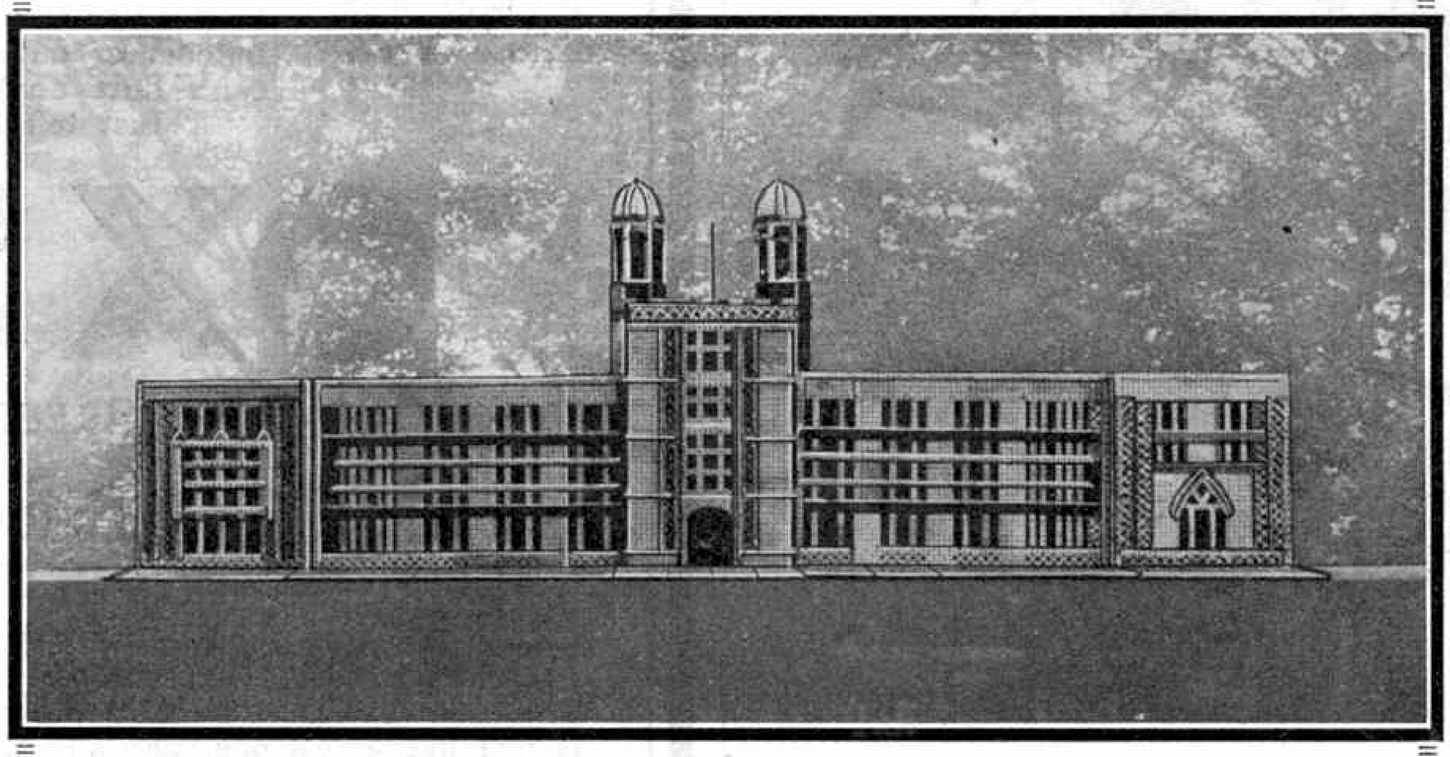
SELECTOR ARM.—A special selector arm for use in conjunction with the Socket Coupling is unnecessary as a standard Crank or Rod secured in a Coupling, will serve equally well. (*Reply to V. K. Rangaswami, Boroda, India, and S. Perrin, Blaydon*).

HELICAL SPRINGS.—A number of uses could no doubt be found for a helical compression spring manufactured from heavy gauge steel wire, and fitted at each end with a collar as shown in the accompanying sketch. We do not, however, agree that a spring of this type would be suitable for use in the chassis of a car, as it would be going against the principles employed



in actual practice to attach the axles to the frame with springs of this type. We are quite aware that there are instances where the Compression Spring (part No. 120b) is too weak, and your suggested article would therefore be useful in these cases. We shall be pleased to receive readers' suggestions regarding methods of employing a spring of this type in conjunction with other Meccano parts. (*Reply to L. Baker, Durham*).

Meccano in Stonyhurst College



Meccano forms a regular item in the curriculum of Hodder Place, the Preparatory School for Stonyhurst College, near Blackburn. Under the guidance of the masters the boys build all kinds of models and thereby achieve, in the pleasantest possible manner, great dexterity and the power to think logically and constructively, as well as a very useful knowledge of the principles of mechanics. At the end of each term a Meccano competition is held, and some well-known engineer is invited to judge and point out defects in construction.

In January, 1928, we published a view of Stonyhurst College, together with a photograph of a Meccano model of the South Front, which was built by the Hodder pupils, whose ages range from 8 to 12. Above we reproduce a further model which the boys have completed recently. This time it is the West or Old Front of the College that is depicted. We feel sure that many "M.M." readers will feel envious of the progressive methods of education enjoyed by the boys of Hodder!

Cadbury's

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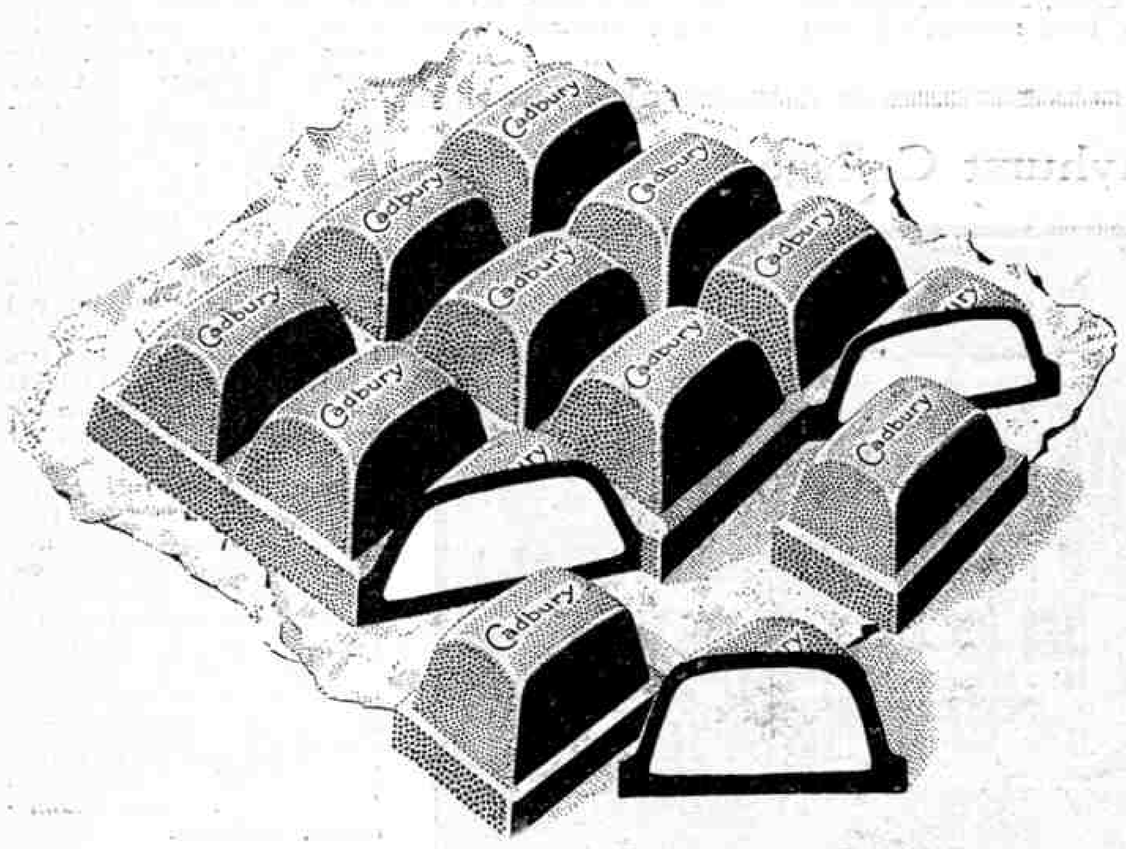

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Results of Meccano Model-Building Contests

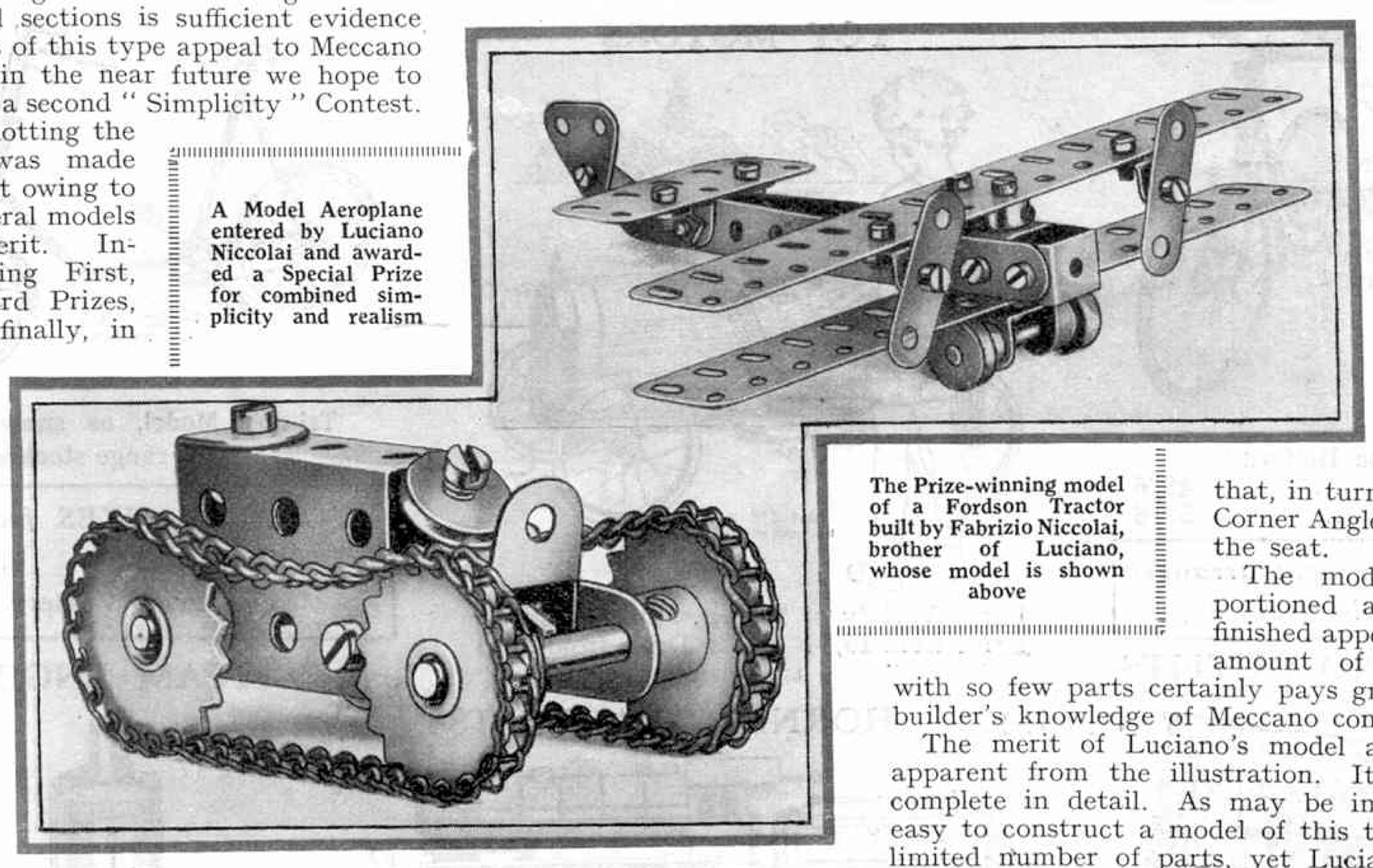
By Frank Hornby

"Simplicity" Competition (Overseas Section)

THE "Simplicity" Contest was announced principally to test our readers' skill in devising realistic models from a minimum number of Meccano parts. As published in the October "*M.M.*," the results in the "Home" Sections were very satisfactory indeed and it is gratifying to find that our Overseas readers responded to the test equally well.

The majority of models submitted in the Overseas Section are very interesting, and although not so varied in character, perhaps, as in the "Home" Sections, they show marked ability on the part of the builders. Some idea of the extraordinarily simple construction displayed by the majority of the entries may be obtained from the accompanying illustrations, which show four typical prize-winning models. The large number of entries in all sections is sufficient evidence that competitions of this type appeal to Meccano enthusiasts, and in the near future we hope to publish details of a second "Simplicity" Contest.

The task of allotting the various prizes was made extremely difficult owing to the fact that several models were of equal merit. Instead of awarding First, Second, and Third Prizes, it was decided finally, in order to treat all competitors fairly, to make a number of special awards, having a slightly higher total value than the original prizes.



A Model Aeroplane entered by Luciano Niccolai and awarded a Special Prize for combined simplicity and realism

The Prize-winning model of a Fordson Tractor built by Fabrizio Niccolai, brother of Luciano, whose model is shown above

It will be remembered that this method was adopted in the "Home" Sections. Under this system awards in the "Overseas" Sections were made as follows:—

TWO SPECIAL PRIZES, each consisting of Meccano goods to value £1-1s.: Fabrizio and Luciano Niccolai, Via delle Forbici, Firenze, Italy.

FOUR SPECIAL PRIZES, each consisting of Meccano goods to value 15/-: Frank A. Purkis, Winnipeg, Canada; F. Bradley, St. Louis, Missouri, U.S.A.; Connal Gill, Coorparoo, Brisbane, Australia; Brian Warner, Grahamstown, S. Africa.

TWO SPECIAL PRIZES, each consisting of Meccano goods to value 12/6: E. Bonnici, Valletta, Malta; James Foley, King Williams Town, S. Africa.

SIX PRIZES, each consisting of Meccano goods to value 10/6: Boey Pak Yeng, Kedah, Malay State; Leigh Brereton, Johannesburg, S. Africa; Ian T. G. Johnstone, Margateretere, R. D. Hastings, New Zealand; Robert Jessen, Dargaville, New Zealand; J. Busey, Seldovia, Alaska; A. Wilson, Morrinsville Auckland, New Zealand.

TWELVE PRIZES, each consisting of Meccano goods to value 5/-; Tony MacLachlan, Dunedin, Otago, New Zealand; Leon Rubenstein, Cape Town, S. Africa; Donald R. Ross, Cape Town, S. Africa; C. Fearnley, Otaki, New Zealand; C. Galdes, Valletta, Malta; A. Shepherd, Bloemfontein, O.F.S., S. Africa; Frederick G. Glass, Pernambuco, Brazil; J. A. Rodriguez, Montreal, Canada; Pier Luigi Bargellini, Florence, Italy; B. Rygner, Odeure, Denmark; Mervyn Wills, Bondi, Sydney, Australia; Aldo Pratelli, Rimini, Italy.

SPECIALLY COMMENDED (Certificate of Merit and Standard Mechanisms Manual): S. McConchie, Waipukurau, Hawke's Bay, New Zealand; H. Nelson Eustis, Alberton, Australia; P. K. Choksi, Karachi, India; L. Tanner, Villawood, N.S.W., Australia; Norman Sheldon, Westmount, P.Q., Canada; E. Worthington, Vancouver, B.C.; J. Neijts, s'Hertogenbosch, Holland.

From the list of prize-winners it will be seen that two Italian boys have secured the largest prizes. These boys, Fabrizio and Luciano Niccolai of Firenze, entered the two fine models shown in the composite illustration on this page. Fabrizio, the elder, constructed the caterpillar tractor while his younger brother Luciano produced the splendid model biplane. Both these models are really very fine representations of their prototypes, and realism has been obtained without sacrificing anything in the way of simplicity. Each model comprises very few parts.

The appearance of the tractor is at once solid and powerful. Excellent use has been made of Sprockets and Sprocket Chain to represent the caterpillar tracks. The front Sprocket axle is journalled in holes in a Channel Bearing, which serves also as the "bonnet" or outer casing for the "engine," while two 2½" Strips bolted to the Channel Bearing form an extension to carry the axle of the rear Sprockets. The driver's seat, which consists of a Corner Angle Bracket bolted to one of the 2½" Strips, is tilted slightly backward, and forms an excellent example of the adaptability of this Meccano part. The steering wheel comprises a ½" Pulley held loosely on a Bolt (which represents the steering column), secured by two nuts to a Flat Bracket that, in turn, is bolted to the Corner Angle Bracket forming the seat.

The model is well proportioned and has a most finished appearance, while the amount of detail obtained with so few parts certainly pays great credit to the builder's knowledge of Meccano construction.

The merit of Luciano's model aeroplane will be apparent from the illustration. It is realistic and complete in detail. As may be imagined it is not easy to construct a model of this type using only a limited number of parts, yet Luciano has managed to obtain a very fine result. The lines of the machine are excellent and the constructional details of the fuselage and undercarriage are so carried out that the model is entirely devoid of crudeness. In particular, note should be taken of the realistic rudder, formed from a 1" Triangular Plate, and the appearance of the twin engines.

We receive comparatively few realistic models of aeroplanes in connection with the competitions, and as this is one of the most simple and at the same time most effective yet submitted, I think the judges were justified in allotting one of the principal awards to Luciano Niccolai.

Brian Warner was presented with a special prize for an interesting model of the "Lister" electric lighting plant. It is shown in one of the accompanying illustrations and it will be seen that Warner has certainly succeeded in selecting an original subject. Electric lighting plants of this type are extensively used on farms and in small villages in various parts of South Africa, where electric power stations are few and far between. The outfit consists usually of a direct-coupled dynamo driven by a petrol or gas engine. The current from the dynamo is arranged to charge large accumulators, from which the current supply for the house is drawn as and when required. This method renders it unnecessary to run the engine and dynamo continuously when using electricity, for the accumulators generally are of large enough capacity to supply sufficient current for many hours before they require re-charging. Warner's model is realistic in appearance and complete down

(*Continued on page 985*)

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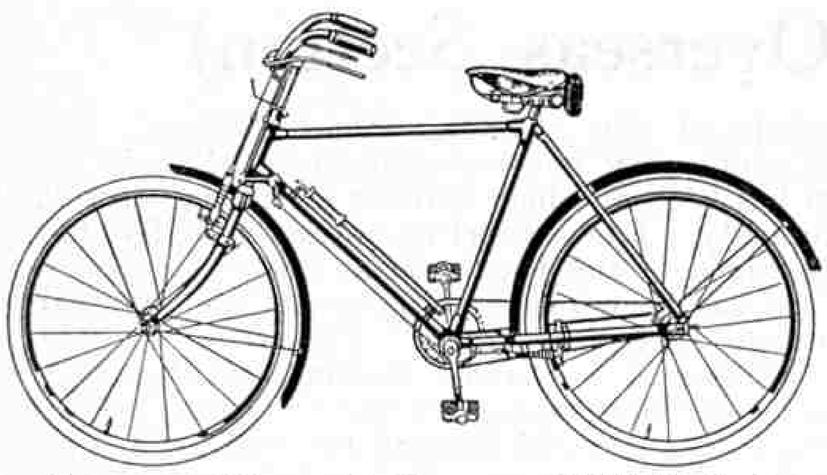

Open or Diamond Frame, **£3/19/6** Cash

"RENSHAW JUVENILE"

Boys' ... **£4/4/–** Cash
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"HALFORD TINY BIKE"

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TINY TRIKES

" The Halford "
As shown **49/6**
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Gradual Payments arranged on Articles from 30/-

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Large Variety of Models. Double Crank Drive from **15/–**. Chain Drive from **31/6** as shown

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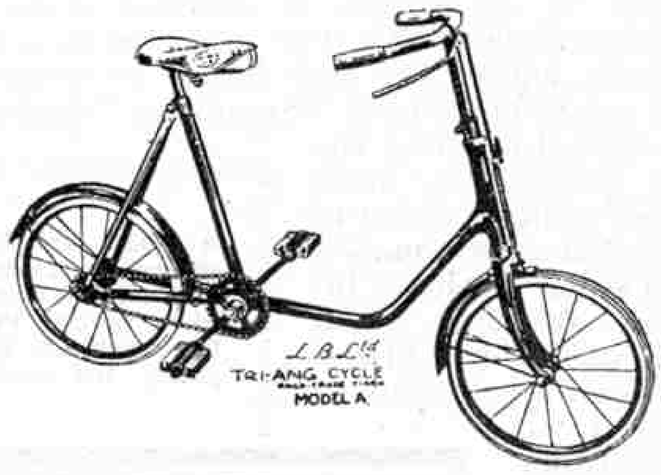

Tri-ang Model, as shown, **29/6**
Wide range stocked

TODDLE TRIKES from 4/6
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Large Variety

MECCANO OUTFITS

All size Outfits stocked at all Depots

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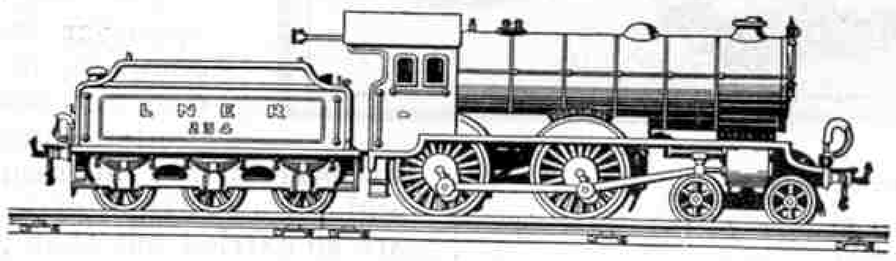

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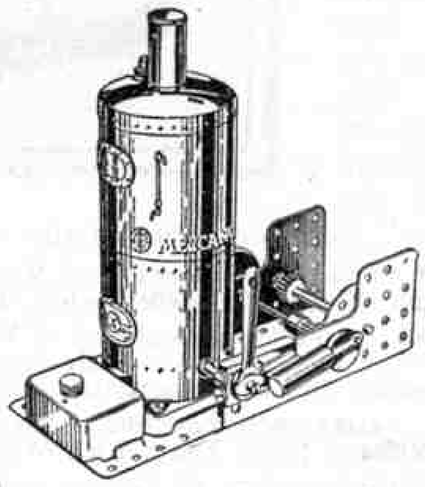

Meccano Steam Engine, **21/–**

FRETWORK OUTFITS & TOOL SETS

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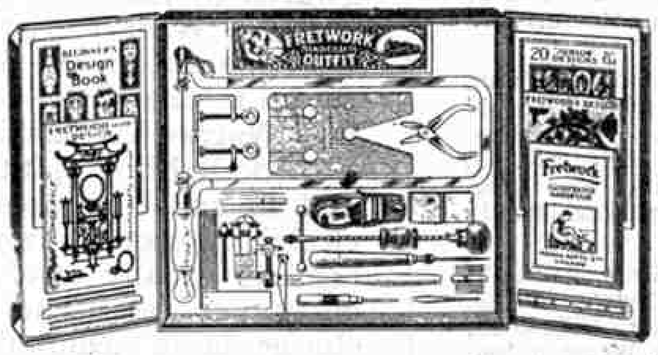

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Large Range Stocked from **1/6** complete

SKATES

Street Models from **2/6** pr.
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Depots in all large towns

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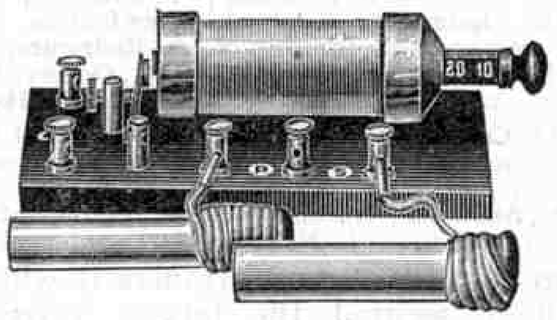


Complete, as shown ... **2/6**
Larger Model **4/6**

Model-building Contest Results—

(*Continued from page 983*)

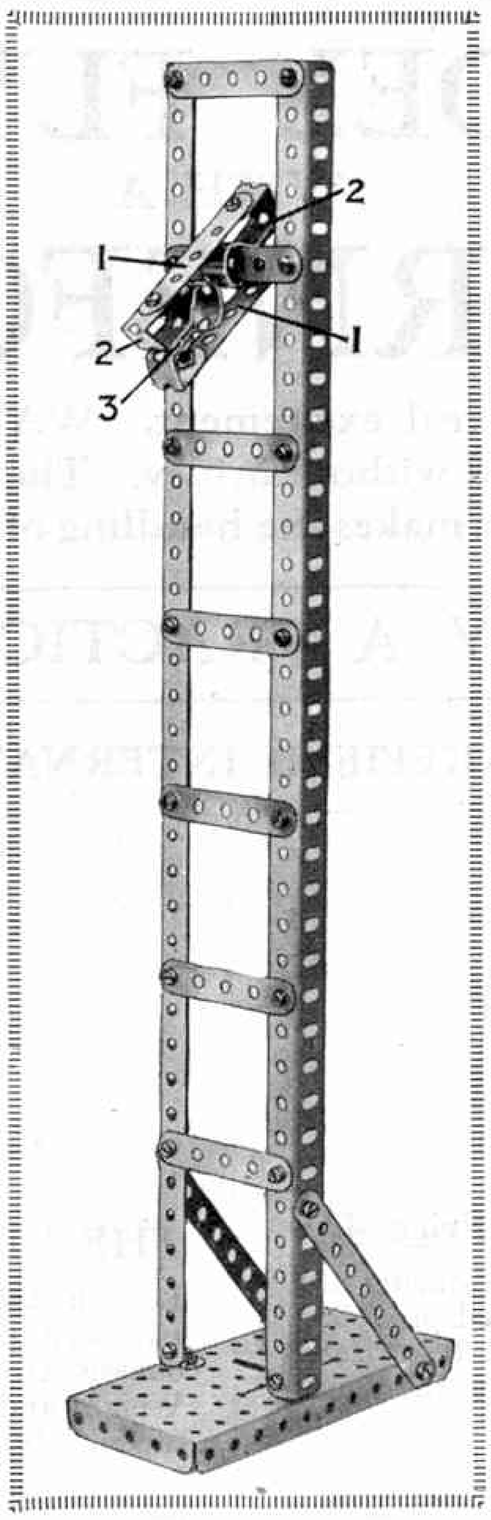
to such details as an imitation switchboard, water cooling pipes to the engine, silencer, radiator fan and carburetter, etc. The silencer, as can be seen in the illustration, consists of a ½" fast Pulley secured to the end of the Rod representing the exhaust pipe. The carburetter is imitated with a number of Strips bolted together face to face. Both these features are shown in our photograph.

The "dynamo" comprises two Bush Wheels connected together by a number of 2½" Strips secured to Angle Brackets. When compared with the actual "Lister" lighting plant the realism of Warner's model can be appreciated.

Francis Bradley secured his prize with the cleverly conceived model "Performing Meccanitian" illustrated on this page. In operation the "Meccanitian" is placed on the top rung of the ladder, when it commences to descend "head over heels," until it reaches the ground. It is highly amusing to watch this apparently marvellous feat, although the explanation is simple.

As can be seen from the illustration the Meccanitian consists of two 2½" Strips 1, to the ends of which are bolted two 5½" Strips 2 bent as shown. It will be noticed that the Strips 2 are bent so as to form a slot 3 at each end of the device. To operate the toy the Meccanitian is placed on the top Strip of the ladder with one of its slots engaging the Strip. When released its unbalanced weight causes it to turn a half somersault, thus bringing the slot at the other end directly over the second Strip of the ladder while the slot at the now upper end allows it to drop from the top to the second rung. The process is then repeated, the Meccanitian again turning "head over heels" and dropping to the third rung, then the fourth, and so on.

The effectiveness of the model may be increased by cutting two pieces of cardboard to represent a front and back view of a clown or acrobat and pasting one to each of the Strips 1. Meccano boys should make a point of building this simple toy for themselves. Its construction will pass away a pleasant half hour and the finished mode will afford plenty of fun both to youngsters and grown-ups. As will be seen it consists of very few parts.



The "Performing Meccanitian," with which Francis Bradley secured a prize

A singularly interesting and amusing entry was submitted by Connal Gill, whose model represents Don Quixote tilting the windmill. The majority of our readers will no doubt be familiar with this incident in Migual Cervantes' immortal masterpiece "Don Quixote," which he wrote in 1605.

Several models of a humorous nature were entered in this section of the Contest but for originality and simplicity of construction it would be hard to excel Gill's entry. Unfortunately it is not possible to illustrate the model, and a brief description must suffice. Don Quixote mounted on "his" steed—the latter consisting of a Flanged Plate to which short Strips are connected to serve as "legs"—is shown in the photograph submitted, with lance upraised ready for the thrust, advancing in realistic fashion towards the windmill. The figure of Don Quixote is well represented with an ingenious combination of Strips, while a Pulley serves for his head. The lance comprises a Meccano Rod. The centre tower of the windmill is square in section and built with Flat Plates, and Meccano Windmill Sails are secured to a centre Bush Wheel that is carried on a Rod journalled through upper holes in the Plates.

An uncommon type of model was that submitted by Leigh Brereton, who chose as his subject a Chinese ricksha. The majority of Meccano boys will not have been so fortunate, perhaps, as to have seen these curious man-hauled vehicles actually in use, but many of them will be quite familiar with their general appearance. Every Bolt and Strip used in constructing the model fulfils a definite and necessary purpose. Nothing is included that could be done away with without detracting from the realism of the finished model. As in actual practice, a back-stay is fitted at the rear of the carriage in such a position as to take the weight when the native leaves the shafts and allows the carriage to tilt backwards slightly.

A novel and well-built entry was that submitted by Frederick Glass, who sent a model Meccano printing press. Those of our readers who are familiar with various types of printing machines may find the following brief description of the model of interest.

The press is of the type in which both the forme and the platen move toward each other until they meet. The platen then falls back on its pivot to its initial position to enable the printer to place another sheet of paper in position, while the inking roller, which has meanwhile passed over the circular ink-pad, moves downward over the surface of the forme and then up again, leaving the types well inked for the next impression.

Two shafts which are geared together, are journalled in two upright Flat Plates bolted to the base by means of Angle Girders. The second shaft carries at each extremity a Bush Wheel and a 57-teeth Gear Wheel and near its centre a cam consisting of an Angle Bracket bolted to a Collar. By inserting a Threaded Pin in one of the holes drilled in its face, each of the two former Wheels become crank discs, and it is from these that the backward and forward motion is imparted by means of connecting rods to the inking roller.

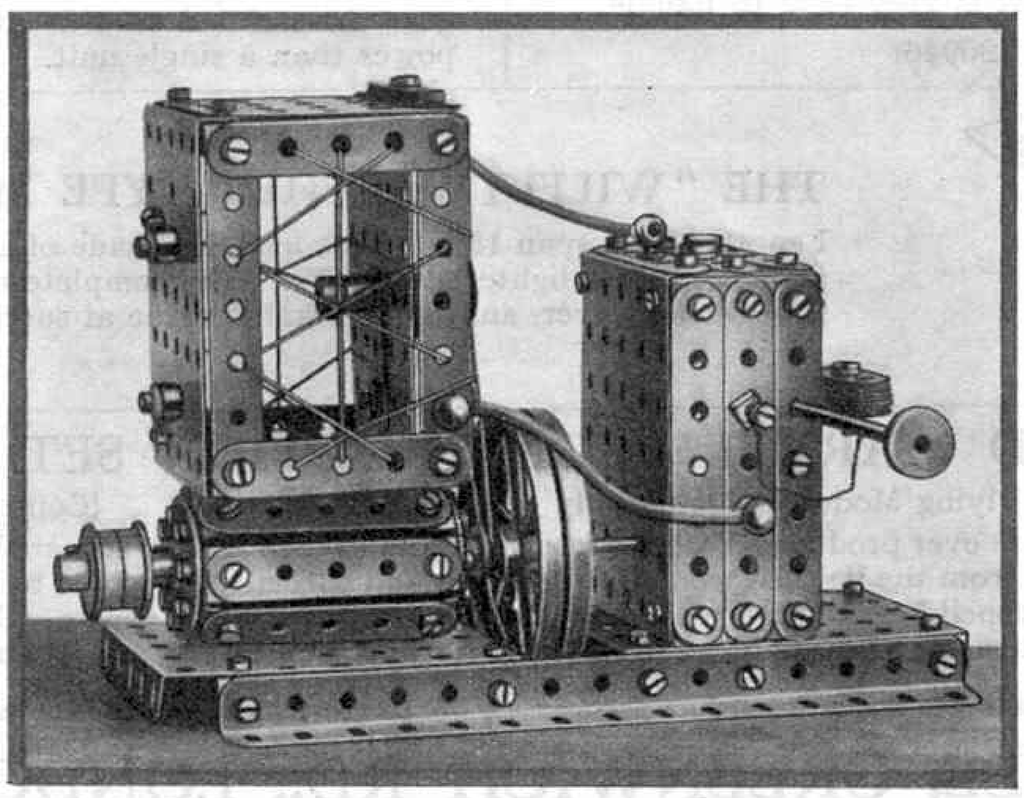
The cam operates the platen at the correct moment in each revolution of the shaft. The platen consists of a Trunnion bolted by its flange to a short Angle Girder and to a Double Angle Strip. It is free to move between the upright Flat Plates. From the centre hole of the flange of the Trunnion there extends a Flat Bracket, through a hole of which is passed a screw to which a Threaded Boss is secured. The Boss acts as a "push rod" and also as a weight to return the platen to its original position after pressing on the forme.

The model embodies mechanisms which make the cycle of operations entirely automatic.

Considerations of space will not permit mention of all the prize-winning models and therefore I am able only to give particulars of some of the more outstanding entries, in the hope that these short descriptions will be of interest and benefit to Meccano boys generally. To describe all the prize-winning entries in a big contest of this kind would necessitate many more pages than it is possible to set aside for the purpose.

In concluding this brief commentary I should like to take the opportunity of offering a little consolation to all competitors who were not successful in the Contest. Those boys who failed to gain a prize did so not necessarily on account of the unsuitability, poor construction, or other fault of their models, but because they had in the "Simplicity" Contest, to compete with some of the most ingenious entries yet submitted in any "*M.M.*" Contest. Almost all the models received were quite worthy of a prize had it been possible to distribute the large number that would, of course, be required.

It is hoped that unsuccessful competitors will not allow their bad luck to stand in the way of future success, for if they will only persevere, there is no reason at all why the next contest should not see their names in the list of principal prize-winners.



The realistic prize-winning model of the "Lister" type electric lighting plant built by Brian Warner

Correction

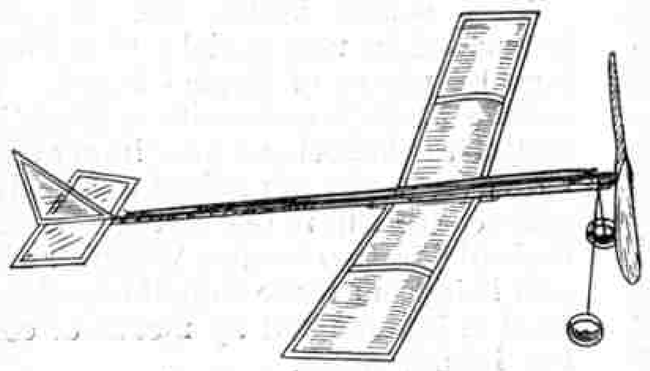
In the lists of prize-winners in the "Simplicity" Model-building Competition (Home Section) published in the October "*M.M.*," W. N. Carnaghan, Glasgow, and E. H. Bradshaw, Sheffield, were included in error as prize-winners in Section B. Both of these names should have appeared under Section A.

MODEL FLYING
WITH A
BRITISH AND WARNEFORD GUARANTEED

For wonderful flights and hours of real excitement. WARNEFORD models will fly fast, slow, "stunt," rise from the ground and land without injury. The special instruction sheet of rigging and flying, supplied with all tractor models, makes the handling of these machines unique in its simplicity.

DESIGNED BY A PRACTICAL AVIATOR

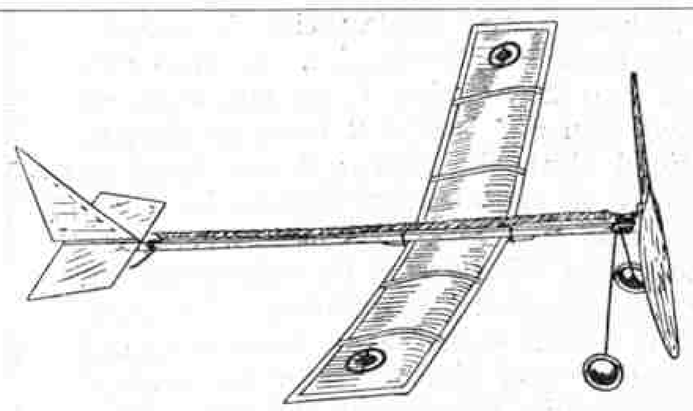
WINNERS OF WAKEFIELD INTERNATIONAL CUP 1929



THE 'MOTH" TRACTOR Price 4/6

Length 19 in., span 18½ in., fitted patent double-bearing and shock-proof chassis, 8 in. hand-carved and balanced propeller, covered red proofed silk. A splendid flyer, and beautifully finished, this model at the price is undoubtedly the finest value ever offered.

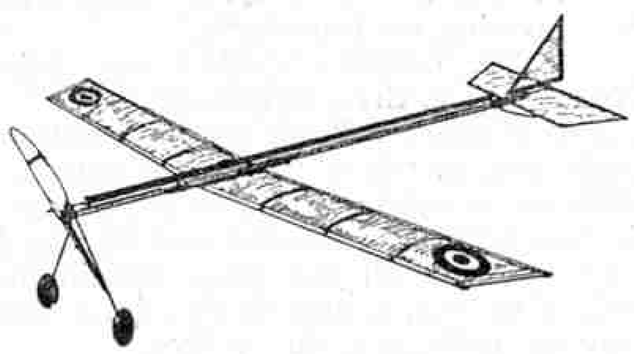
(Patent No. 296946)



THE 'DEMON" TRACTOR Price 7/6

Length 25½ in., span 23 in. Fitted 10 in. hand-carved and balanced propeller, patent double-bearing and shock-proof chassis, covered yellow proofed silk with identification discs. Weight and wind resistance are reduced to a minimum in this model, giving the utmost duration of flight.

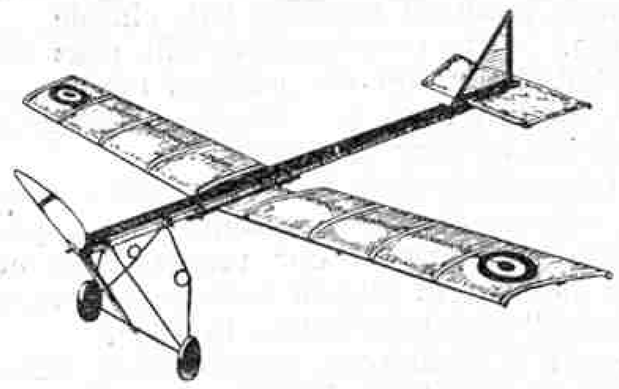
(Patent No. 296946)



THE "SWIFT" TRACTOR Price 10/6

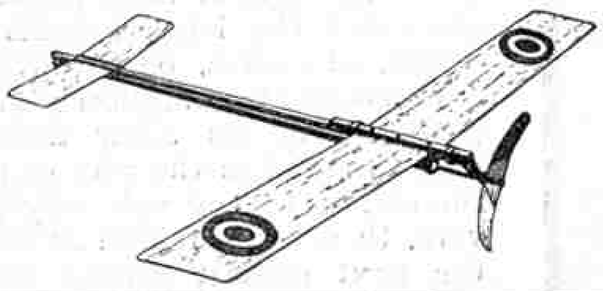
Length 30 in., span 26½ in., fitted 11 in. hand-carved and balanced propeller. Patent double-bearing and shock-proof chassis. Covered yellow proofed silk with identification discs. A long and very steady flight is obtainable with this model, and though of large dimensions it is very easy to handle.

(Patent No. 296946)



THE "RACER" TRACTOR Price 21/-

Length 32½ in., span 31 in., fitted 12 in. hand-carved and balanced propeller, patent twin gear rocking bracket and shock-proof chassis. Reinforced frame wing covered yellow proofed silk with identification discs. A fast and powerful machine, designed for the aeroplane enthusiast. The twin gear drive fitted to this machine gives 100 per cent. more power than a single unit. (Patent No. 296946).



THE "WILFLY" PUSHER TYPE MONO Price 1/6

Length 15 in., span 15 in. This model is made of a wood, specially imported for the purpose, that is lighter than cork. The complete machine, weighing less than ¾ oz. is a splendid flyer, and is remarkable value at such a low price.

THE "WARNEFORD MARVEL" CONSTRUCTION SET Price 1/6

Builds a 15 in. "Tractor" Type Flying Model, **weighing only ¼ oz.** (Complete Set of Parts in Sealed Box).

This is the lightest Model for its size ever produced, will rise from the ground, and can be adjusted for stunts, or to climb vertically into the air. The parts are made from the lightest wood in the world, and specially imported by us for these Models. The length is 11 ins., span 15 ins., a 7½ in. propeller, and fibre wheels with double bearing metal centre, all wire and metal parts, including wheels and chassis, being finished ready to assemble, and is complete with **Full Size Working Drawings** and explicit instructions.

Obtainable from all good Toy Shops, Stores, and Sports Dealers **Demonstrations will be held in most of the Principal Stores this Xmas**

SOLE MANUFACTURERS: F. J. MEE, GREENWICH RD., LONDON, S.E. 10 PRICE LISTS POST FREE

Competition Page

Can You Read Faces? A Jolly Christmas Competition

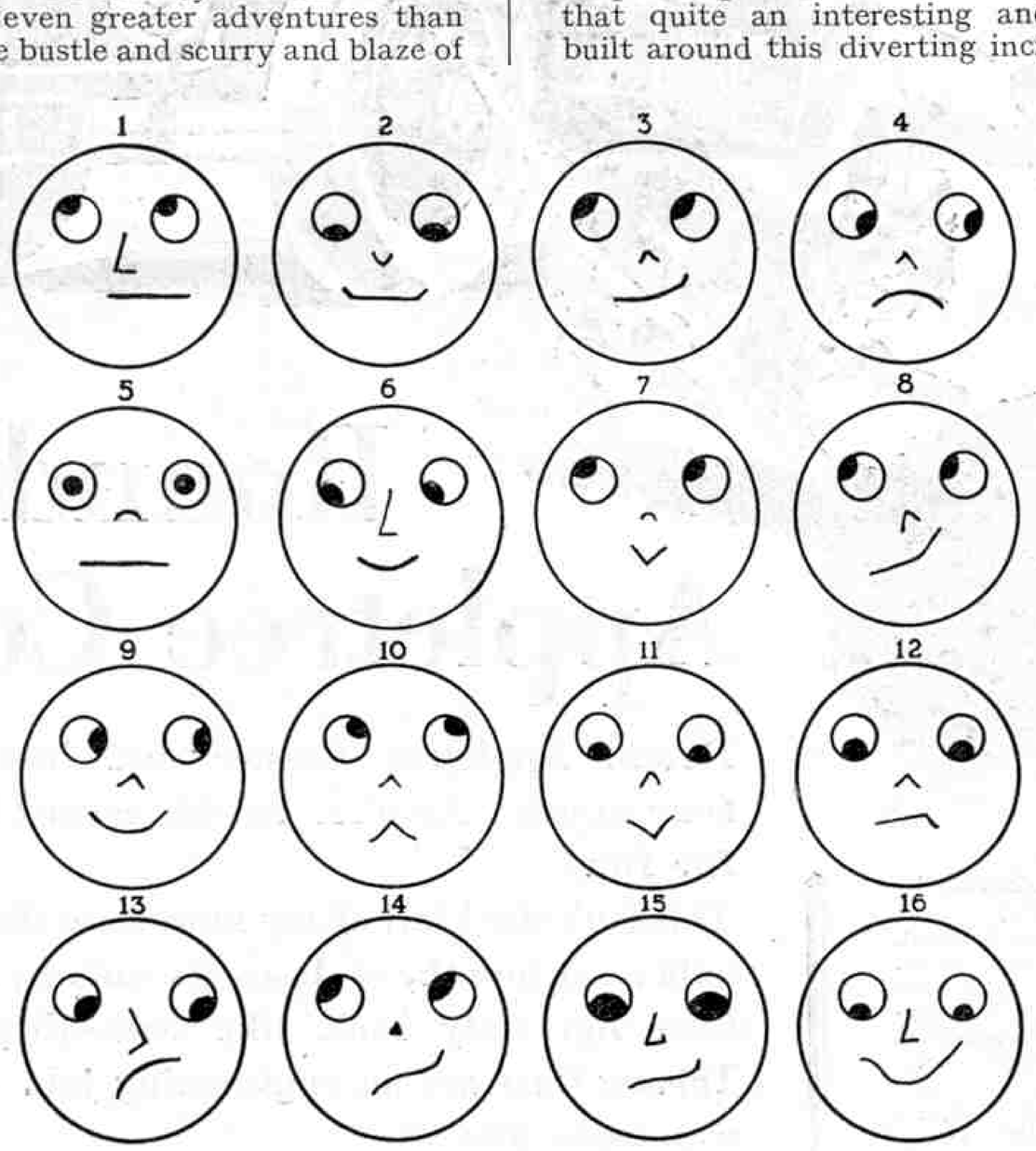
Christmas is the jolliest time of the whole year and the weeks immediately preceding the great day, are full of eager excitement. The thrill and fascination of Christmas shopping is an all-absorbing preliminary to the hectic gaiety of the holiday season itself.

Shopping trips with parents are even greater adventures than usual, for they are carried on amid the bustle and scurry and blaze of light of the big shops and stores with their entrancing window displays. Meccano and Hornby Train depôts inevitably become magnetic centres of attraction, for these are shops where the desires of every boy may be gratified.

During a recent visit to a Meccano store in a big city we were impressed with the excited happy expressions flitting to and fro on the faces of the boys grouped outside on the pavement, as they gazed through the window, first at a great Meccano model of a Transporter Bridge; then at a fine No. 7 Outfit with which, if only they possessed it, they could build this wonderful model; and lastly at a splendid display of Hornby Trains and accessories, prominent among which was a beautiful "true-to-type" model of a Midland Compound Engine.

As we stood in the shop watching the scene a boy and his Father stopped and for some time the pair stood silently looking at the window show. An animated conversation followed, during which it became evident to us that the boy was using all the arguments at his command in an endeavour to persuade his Dad to buy him a Meccano Outfit. From where we stood we could not hear their conversation, of course, but we were able to judge the trend of their talk from the doubt, anxiety, cogitation, hopefulness, insistence, eagerness, joy, and finally triumph, that was registered in the excited expressions that surged across the youngster's face, as he sensed his Father's willingness to listen.

We found it quite a fascinating task trying to interpret the youngster's expressions into conversation. The problem proved so interesting indeed, that as Father and Son eventually entered the shop and purchased a No. 3 Outfit, the thought occurred to us that quite an interesting and amusing competition could be built around this diverting incident.



On this page, therefore, we have endeavoured to reproduce in simple form the expressions that passed across the boy's face as he argued with his Father outside the shop window! They are shown in the sixteen small pictures reproduced on this page, and readers are asked to study each picture carefully, and then to write a short account, not more than 500 words in length, stating exactly what they imagine to have been the arguments and counter-arguments of the boy and his Father. The pictures show the expressions on the boy's face exactly in the order in which they were seen, and competitors should deal with them in perfect sequence.

The entries will be divided into the customary two sections: A for those from competitors aged 16 years and over; B for those under 16. In each section prizes of Meccano or Hornby Train Products (to be chosen by the winners) to the value of £1/1/– and 10/6 respectively will be awarded to the senders of the two best stories in order of merit, and in addition there will be a number of consolation prizes. Entries should be addressed to "Expressions, Meccano Magazine, Binns Road, Old Swan, Liverpool," and sent to reach this office not later than 31st December. Entries from Overseas competitors must reach us not later than 31st March, 1930.

Every competitor is reminded that he must write his story on one side of the paper only, the other side being reserved solely for his name, age and address, which must appear on each sheet of paper used.

COMPETITION RESULTS

28th Drawing Contest.—The enthusiasm of our readers both for aviation and drawing contests was manifested in no uncertain manner by the splendid entry for this contest, the subject of which was "A Schneider Trophy 'Plane." The enthusiasm was equalled by the wonderful skill exhibited by a big percentage of the competitors, a feature of both sections being the really high level of merit that was reached.

After consultation with the Editor it was decided to extend the prize list considerably, so that acknowledgment of really good work could be given to many competitors whose efforts, though of deserving standard, were in danger of being "squeezed out" by the unusually big number of excellent drawings.

The list of awards is as follows:—First Prizes: Section A, N. Shacklock (Manchester); Section B, I. Thompson (Darlington). Second Prizes: Section A, L. T. Levitt (Swansea); Section B, R. C. Randall (St. Albans, Herts.). Third Prizes: Section A, R. G. Emm (Paddington, W.2); Section B, R. H. Hart (Bushey, Herts.). Fourth Prizes: Section A, O. A. Kimmings (East Acton, W.3); Section B, P. G. Crosby (Oxford).

October Crossword Puzzle.—The solution of this contest will be given as soon as the Overseas section has closed. In the meantime competitors from the United Kingdom and the Irish Free State will be interested to see the list of awards for the Home section. 1. Miss M. Cocks (Golders Green, N.W.11); 2. A. Lonnon (Kensington, W.8); 3. A. Shattock (Northampton); 4. D. G. Couper (London, N.W.4).

Competition Closing Dates:

HOME		
Christmas Presents	... ...	21st December.
"Expressions"	... ...	31st December.
Cricket Bat	... ...	31st March.
OVERSEAS		
Meccano Figureword	... ...	31st December.
Cricket Opinion	... ...	31st December.
October Crossword Puzzle	...	31st January.
28th Drawing Contest	...	31st January.
Loco Figures	... ...	28th February.
29th Drawing Contest	...	28th February.
"Expressions"	... ...	31st March.
Cricket Bat	... ...	31st March.

Watch the Closing Dates:

Competitors, both Home and Overseas, are particularly requested to make a careful note of the closing dates of any competitions for which they intend to enter. Week by week we receive entries for various competitions that have been closed for some time. Some of these entries are excellent and it is a pity for competitors' good work to be wasted on account of losing sight of the closing date.

Entries cannot be returned unless a stamped and addressed envelope, or other suitable wrapper, is forwarded for the purpose with the entries.

OVERSEAS

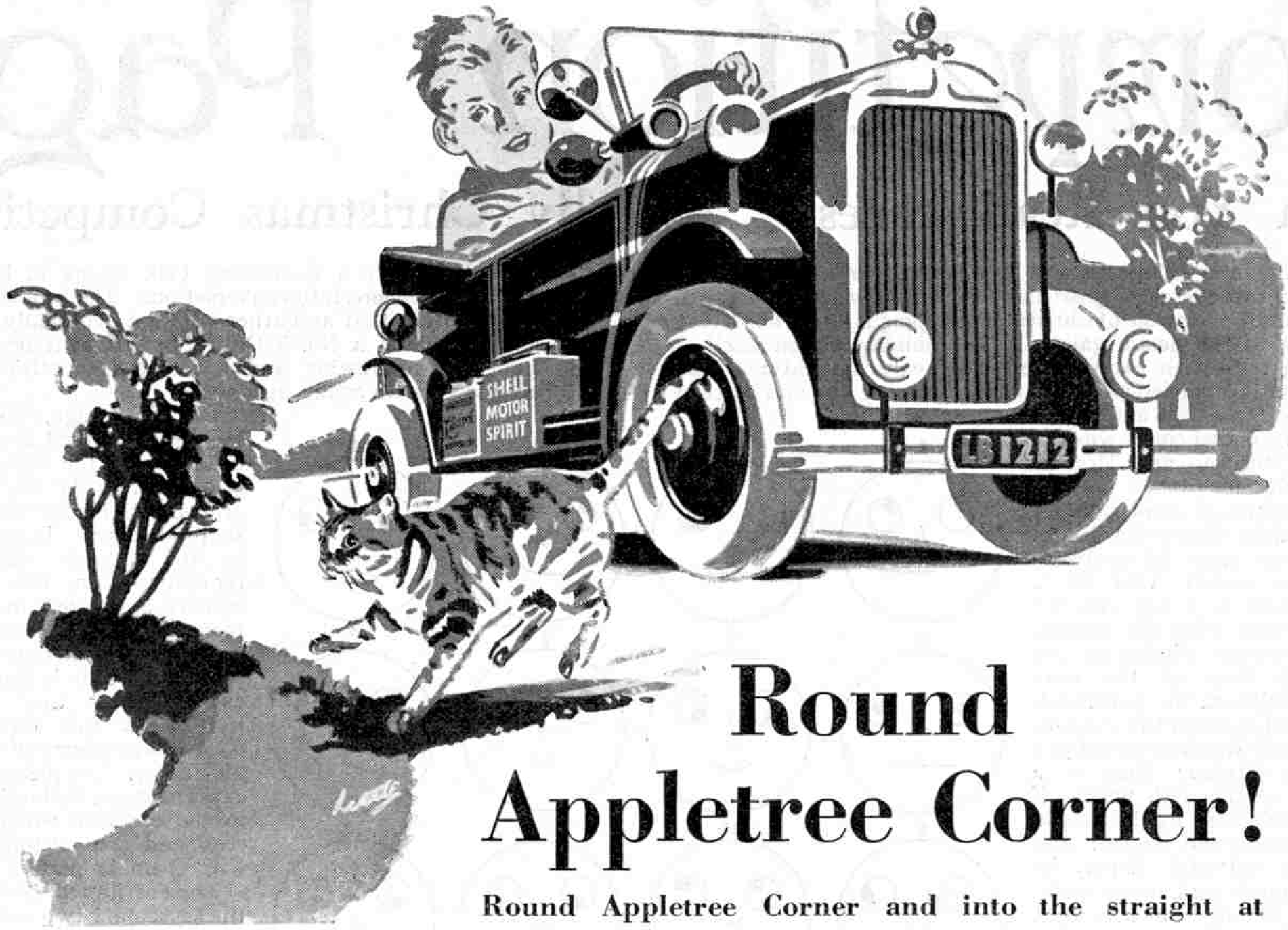
Limerick Skeletons Contest.—This contest brought forth some very interesting and amusing entries. This was especially noticeable in the third of the skeletons, in which greater scope was given to the ingenuity of the competitors. The "old lady of Liverpool" did many remarkable things, from hiding herself in a grammar school to hiding her cash in her wool. According to the competitor who alleged that the lady hid in the grammar school, when asked if it meant that she couldn't pay rent, she replied with a wink "I'm the teacher, fool."

The successful competitors were as follows:—1. Miss G. Bettesworth (Capetown); 2. J. A. Rodriguez (Montreal); 3. R. Johnson (Vancouver); 4. T. James (Durban).

27th Drawing Contest.—First Prizes: Section A, D. Ross (Cape Town, S.A.); Section B, N. G. Brierley (Auckland, N.Z.); Second Prizes: Section A, J. G. Guanadurai (Trichinopoly); Section B, N. F. Robbins (Melbourne). Consolation Prize: R. Hastings (Madrid).

February Crossword Puzzle.—1. Peter F. Woodman (Tenerife); 2. J. McAdam (Grahamstown, S.A.); 3. N. A. Bannatyne (Auckland, N.Z.); 4. N. Bonner (Queenstown). Consolation Prizes: T. Brown (Mussoorie, India); R. G. Mellsop (Auckland).

Holiday Stories Competition.—First Prizes: Section A, J. Hyde (Matakohe, N.Z.); Section B, J. Credil (Cape Town, S.A.). Second Prizes: Section A, R. Mitchell (Kuala Lumpur, F.M.S.); Section B, L. Parker (Toronto). Consolation Prize: J. L. Moyes (Norwood, South Australia).



Round Appletree Corner!

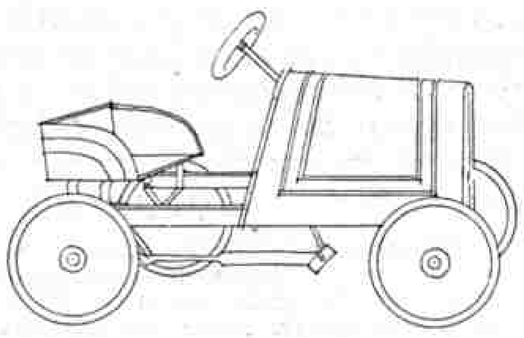
Round Appletree Corner and into the straight at four m.p.h. Another British record beaten—a record for fun!

This isn't the kind of toy motor car that breaks its back-axle in a month, or loses its nuts in a week. Tri-ang Cars not only look like cars–they last like cars. Tri-ang Cars are an engineering job. "Ask the 'man' who owns one!"

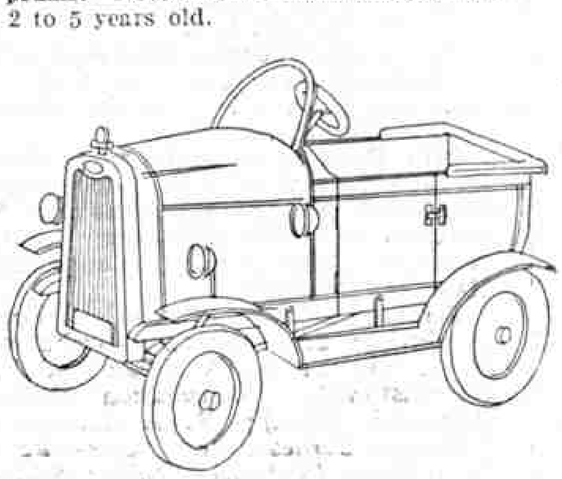
Tri-ang owner drivers are guarded from driving strain—Tri-ang engineers see to that. Light steering and easy sitting make fun of the miles. Cushion tyres, and ball-bearings make child's play of racing the car along. Just look at the specifications. If you want to be a success this Christmas, give a Tri-ang Car. Prices from 15s. to £15 15s. 0d. Every one good value.

Brief Specification: **Twin push stroke (2 leg power R. S. P. C. C. rating). *No tax* on the driver. *No insurance* necessary. *Maximum brake horsepower*—Tri-ang Cars don't break.**

TRI-ANG
"BUICK EMPIRE ROADSTER."
(Illustrated above.)
Replica of Buick radiator heavily plated. Chain drive to ball-bearing axle. 11 in. steel disc balloon wheels, cushion tyres. Nickel plated bumpers, domed mud-guards, Splintex adjustable windscreen, driving mirror, bulb horn, licence holder, 5 lamps. Starter on dashboard (makes realistic noise when pressed). Adjustable upholstered seat, number plates, tool box, luggage grid, oil and petrol spare cans. Price, ready for the pavement - - - - **£4 10 0**



TRI-ANG LIZZIE No. 3 - - **15/-**
All-steel body. Easy running double crank drive. 8 in. rubber tyred wheels. 6 in. steering wheel. Lamp. Rubber pedals. Recommended for motorists from 2 to 5 years old.



TRI-ANG
CHEVROLET DE LUXE No. 4 - **29/6**
Scale model Chevrolet radiator. Easy running, double crank drive. 9 in. steel disc balloon wheels. Rubber tyres and pedals. Accessories include 4 lamps and motometer. Side door opens.

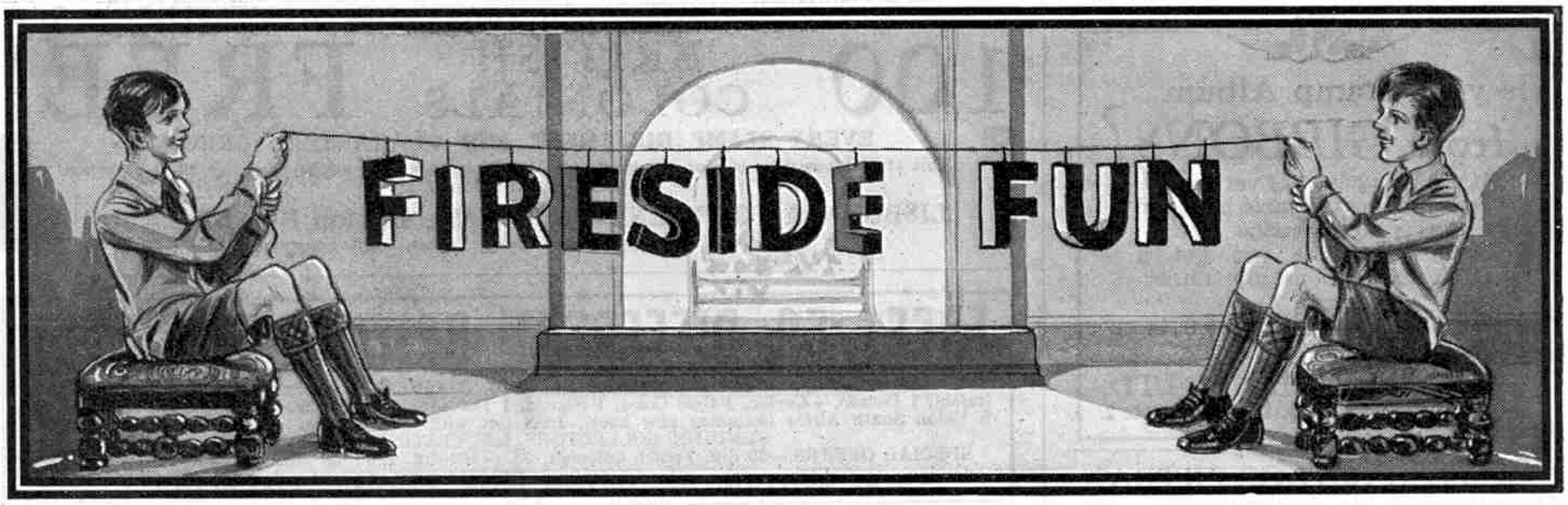
TRI-ANG

MOTOR CARS 15/- TO £15-15-0

Count them on the pavement!

★Tri-ang Cars are on view at most Toy Shops. Write for folder of Tri-ang Cars and other Tri-ang Toys, illustrated in full colours **FREE ON REQUEST.**

LINES BROTHERS LIMITED, MORDEN ROAD, LONDON, S.W.19



ADAM AND EVE ATE LOTS OF APPLES

The vicar said he felt sure they only ate 1.

The curate said he didn't think that could be right because Eve 81 and Adam 812. Total 893.

The warden said that both were quite mistaken, because Eve 814 herself and Adam 8124 himself. Total 8,938.

The sexton thought they were all wrong. He said that Eve 8142 know how it tasted, and Adam 28142 know what it was like. Total 36,284!

* * * *

Clubman: "I've struck a perfectly priceless idea. I've arranged to give a man £2,000 on condition that he relieves me of all my worries."

Friend: "That's fine, but where are you going to get the £2,000?"

Clubman: "Ah, that will be his first worry."

"Evening Times-Globe."

* * * *

Master: "How is it I've had to wait half an hour for my water?"

New Maid: "The first lot took too long getting hot, so I put on a fresh lot."

* * * *

"Tommy, can you tell me one of the uses of cow-hide?"

"Er, yessir. It keeps the cow together."

* * * *

"Please, miss, do two and two always make four?"

"Yes, of course they do, Johnny."

"Well what about when they make twenty-two, miss?"

* * * *

According to the "*Daily News*" the following notice appears outside a power station in Ireland:—"Warning!—To touch the wires means instant death. Anyone disregarding this warning will be prosecuted."

* * * *

Inquisitive Visitor (to famous footballer): "What was the most exciting game you ever played?"

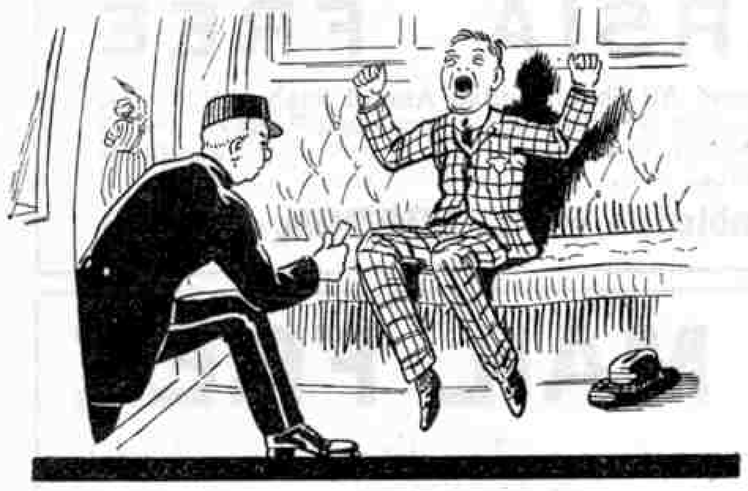
Footballer: "I remember I was running along down the field with the ball at my feet, when suddenly I saw the referee look at his watch, and the crowd shouted, 'Shoot, man, shoot,' and I shot."

Visitor: "Did you score?"

Footballer: "Score? Why it took me ten minutes to get the bed-rail out from between my toes!"

* * * *

ABOUT TURN!



"Your ticket," said the inspector to the sleepy passenger, "is for Manchester, and we are going to London."

"Good heavens," said the passenger, "does the driver know?"

* * * *

The proud parent was talking about her only son.

"And how did he get on in his examination?" she was asked.

"Very badly," was the reply. "But then it wasn't fair. They asked him about things that happened before he was born."

* * * *

Landlady: "You've been here a month and you haven't offered to pay any rent yet."

Lodger: "But you said it would be like home. I never offered at home." "*The Humorist.*"

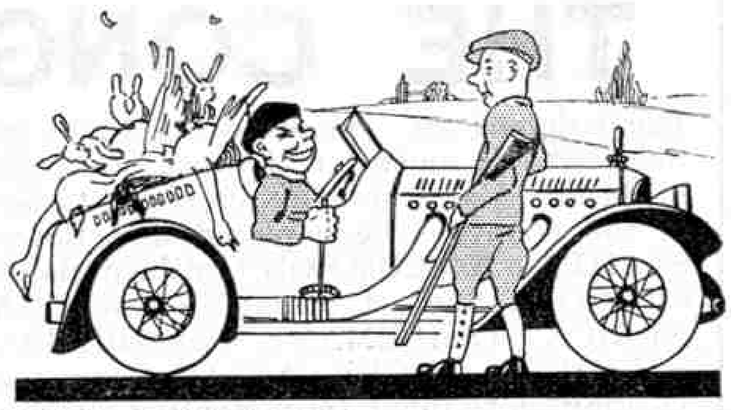
THIS MONTH'S SHORT STORY

Little Boy Blue,
Come blow on your horn,
The cross roads are near,
And your brakes are worn.

Little Boy Blue
Didn't trouble to peep;
He's under his tombstone,
Fast asleep!

* * * *

GOOD SPORT



"Any luck to-day?"

"One deer and two hares. And you?"

"Six hares, twelve rabbits, nine geese, thirteen hens and four ducks!"

"All with one gun?"

"No—with one motor car!"

* * * *

First Lady: "What I like about the new curate is that he is a real altruist."

Second Lady: "Indeed! When I heard him in the choir I could have sworn he was a tenor."

* * * *

He was certainly a restless sort of a passenger, and at every stop, both in and between stations, he interrogated the guard as to the cause of delay. At last that official got somewhat peeved.

"Look here, sir," said he. "If the train is so mighty slow, you had better get out and walk."

"That's kind of you," replied the passenger. "I may be short of time, but I'm not in quite such a hurry as that!'

* * * *

Master to Tommy: "What is an Epistle?"

Tommy (after much thought): "Please, sir, the wife of an Apostle."

* * * *

HIGHLY MODERNISTIC!

A couple of rustics discovered an artist, palette in hand, at work on a picture. "What is he doing?" asked one wonderingly.

"Can't you see he's painting two pictures at once?" replied his companion, adding, "I like the one he's got his thumb through better than the other!"

"Liverpool Post."

* * * *

Little Joan (tearfully, after falling down): "I'se hurted myself!"

Mother: "Well, don't cry."

Joan (indignantly): "What's crying for, then?"

* * * *

"Daddy, what did the Dead Sea die of?"

"Oh, I don't know, child."

"Daddy, where do dreams go when you wake up?"

"I don't know."

"Daddy, why are there so many bones in fishes?"

"I don't know that either."

"Goodness, daddy, who made you an editor?"

* * * *

Tommy was a new-comer at boarding school. When he had been there three days he found it was not quite what he had expected. Accordingly he wrote to his father:

"Dear Dad, life is short. Let us spend it together. Your loving Tommy."

* * * *

Traveller: "What is the distance to Kilmallock?"

Irish Booking Clerk: "About sixteen miles, sir; but we do it much less on the fast trains."

A WATERY FAREWELL

A Frenchwoman and an American woman, each of whom had a limited knowledge of the other's language, became acquainted at a holiday resort. Somehow or other however, they managed to understand each other, and, all things considered, spent many happy days together. At last the end of their holidays came, and they parted at the station.

"Ah, well," smiled the American sadly, "reservoir!"

"Tanks!" responded her friend.

* * * *

A little boy sitting in the bus, was crying bitterly, and the conductor, on ascertaining that the cause of the trouble was that he had lost the money for his fare, very kindly gave him a free penny ticket.

As he turned away after performing this good deed, however, he was halted by a small, but indignant, voice, exclaiming: "Ere—'oo d'yer fink yer a-swindlin'? Give us me change—it was a tanner wot I lorst!"

"Liverpool Echo."

* * * *

Able-bodied Tramp: "Please, mum, could you give me a bite to eat? I am very hungry?"

Lady of the House: "If you are hungry why don't you try to get some work?"

Able-bodied Tramp: "I've tried that, mum, but it only makes me hungrier."

* * * *

Little Charlie: "You do look so tired, mother."

Mother: "I'm so tired dear, that I cannot move a hand."

Little Charlie: "Then I want to tell you that I've eaten most of the strawberry jam."

* * * *

An old villager had been offered a pound note if he would let an artist paint him. He hesitated for a while.

"It's easy money," prompted the artist.

"Oi know that, zur," was the reply. "Oi were just thinking how Oi should get the paint off afterwards."

* * * *

"Signor Basso is a wonderful singer. He can fill the largest hall with his voice."

"That's nothing. My daughter can empty a room with hers!"

* * * *

AN IMPOSSIBLE FEAT

A terrific clatter was heard coming from the kitchen.

"Horrors!" exclaimed Mrs. Smith, running out. "What is that noise?"

"Sure, mum," came the voice of Bridget, the maid, "you don't expect me to break six plates and two dishes without any noise, do you?"

* * * *

"You're not ill," said the doctor. "You're just suffering from lack of exercise. Do you think you could manage to take a two-mile walk every day?"

"Easy!" replied the patient. "I'm a postman!"

* * * *

Traveller: "Excuse me, miss, but this cup of coffee has a distinct taste of cocoa!"

Waitress: "I'm sorry, sir, I must have given you tea."

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15	„	4d.	20	„	6d.
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STAMP COLLECTING AS AN INVESTMENT

IN these pages for several years past, month by month, many of the delightful side tracks of stamp study have been revealed, and materialistic matters, such as the money-making possibilities of our hobby, have been ignored. The financial side is worth consideration, however, particularly in a month when many boys are taking up stamp collecting for the first time.

At some stage in his schooldays every boy is smitten by the stamp collecting mania, but, unfortunately, all too many lose interest very quickly. Nevertheless, most of those who give up the game at an early stage would not do so were they to realise that stamp collecting is one of the few hobbies that can be made to give a sound financial reward, and that among the stamps they have accumulated there is just a possibility that there may be items of considerable potential value. The set for which they paid a couple of shillings last year, merely because they liked the design, may be worth a ten-pound note in 20 years' time.

Let me quote a case from my own experience. In my younger days I also bought stamps that had attractive, pretty designs. In 1901, the first issue from British New Guinea, now known as Papua, with its picture of the quaintly shaped "*Lakatois*," native canoes, intrigued me greatly and I determined I would secure a set somehow. I remember well how I danced with glee when a sympathetic uncle advanced enough—2/- I think it was—to buy the six lowest values, ½d. to 6d. Later, another unexpected gift enabled me to acquire the shilling value also. I think that cost another 2/-, and thus my temporary ambition was achieved. At that time I had no thought of stamps being a splendid form of investment, but to-day my 4/- purchase of 1901 is catalogued at £6! Several other "pretty pretty" sets bought in my earlier days have increased 15 to 20 times in value. There are few other hobbies that provide such financial returns to small investments.

It would be a serious mistake, however, to run away with the idea that stamp collecting is an infallible method of making money, and that the investment side is the only worth while side of the hobby.

Visits to cinema shows are not made because the picture-house manager meets his patrons at the exit to return their seat money or to give them presents for having attended the entertainment. Similarly, purchases of stamps should be made from the point of view of their present interest. By buying only good stamps however, and avoiding the temptation to pick up huge packets of cheap rubbish merely for the purpose of increasing the numerical strength of his collection, the collector can be certain that, not only will his hobby give him pleasure in pursuit and study, but his collection will steadily gain in value.

Occasionally he may even pick up a specimen that may attain rarity, and consequently a high value, in a short space of time.

We can imagine the eager collector asking: Is it possible to-day to pick up any really good stamps at prices within the limits of the young collector's pocket? Are there any modern issues that are likely to attain high values from comparatively obscure beginnings? Both questions can be answered with an emphatic "Yes!" Judgment must be exercised in buying. Obviously experience is the prime factor in building up good judgment and in the scope of a short article there is little that can be done to help young collectors, beyond indicating one or two directions to which they may safely turn attention.

Among recent modern issues we would recommend our readers to buy the new issue from the Vatican City, specimens of which are illustrated here. It is the first issue of a new and remarkable monarchy, and is bound to be popular throughout the world—experts predict it will be one of the most popular stamp issues ever known. The demand during its currency inevitably will make it a big issue numerically, but this is a temporary set and is bound to rise quickly. Another feature in favour of this issue is the fact that the Italian exchange rate is greatly in favour of Great Britain, and the stamps can be bought comparatively cheaply. As the exchange moves in favour of Italy—slowly but steadily it is doing so now—the English value also must rise.

The value of a stamp necessarily is determined by its scarcity, and because age is a principal factor in creating scarcity, it would be a sound move for the young collector who is building his collection on right lines, to keep an eye open for good offers of old stamps. For example, there are a few of the early British colonials of pre-1870 days, and first issues of Colonies formed since that date, still catalogued at less than 1/-. Purchases among these are certain to provide a return, for they all must increase in price in the very near future. In many such cases the prices have remained stationary for several years, and when the marking up does come, it will be a sharp advance.

It should not be assumed that such stamps will provide fortunes in a few years. Obviously, it will rarely be possible to purchase a stamp one week and sell it back to the same dealer the next week at a profit. The purchase price of any article contains a fairly big margin of profit to the seller and not until he can see a further satisfactory gain will he consent to buy it back. For that reason, the collector who looks to his stamp collection to provide a fortune in his declining years, in most cases, is doomed to disappointment. Between fortunes and satisfactory dividends there is a big gulf, however, and the collector who regards his hobby as a

(*Continued on page 993*)

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FOR FURTHER STAMP ADVERTISEMENTS SEE PAGE 1015.

Binding the "M.M."

There are two methods of binding the "*M.M.*" to preserve back copies from the destruction that inevitably will be theirs should they be handled for any lengthy period without protection. First there is the spring-back binder system, that permits the copies to be inserted or removed from the binding case at will. This is intended primarily as a temporary arrangement for the protection of copies during the currency of their volume.

Handsome spring-back cases specially prepared for the "*M.M.*," with the name blocked in gold letters on the front cover, can be obtained from Meccano Limited, Binns Road, Old Swan, Liverpool, price 3/– and 4/6 for sizes large enough to hold 6 and 12 copies of current issues respectively.

Permanent binding cases for back numbers of the Magazine can be supplied by Messrs. O. H. Bateman and Co., 23, Hanover Street, Liverpool. These cases are supplied in two sizes (1) for six copies, price 3/6 and (2) for twelve copies, price 5/3 post free in each case. The binding cases are supplied in what is known as "Quarter Basil, full cloth"—that is to say three-quarters of the sides are dark crimson cloth and the back and a quarter of the sides are dark crimson leather as shown above. The case is tastefully embossed in gold with the name "Meccano Magazine," and on the back is the name and volume number.

Binding Six or Twelve Copies

These binding cases are supplied so that readers may have their Magazines bound locally, but where desired, the firm mentioned above will bind Meccano Magazines at a charge of 6/6 for six issues or 8/6 for twelve issues, including the cost of the binding and also return carriage. The covers of the Magazines may be included or omitted as required, but in the absence of any instructions to the contrary they will be included.

Whilst the binding of the twelve Magazines is quite satisfactory, they form a rather bulky volume and for that reason arrangements have been made to bind six months' Magazines where so desired, as explained above. Back numbers for any volume can be bound and the case will be embossed with the volume number.

Readers desiring to have their Magazines bound need only make a strong parcel of them, include a note of their name and address together with the necessary remittance, and send the parcel direct to Messrs. O. H. Bateman and Co., carriage paid.

Stamp Gossip

First Vatican City Issue

The most interesting of all recent issues is that from the Vatican City, described in our stamp article this month as destined to be the most popular set of all time.

The Pontifical arms, consisting of the Papal Crown and the Crossed Keys of St. Peter, form the design for the eight lower values, ranging from 5c. up to 75c., this being more or less a revival of the designs used for the Papal States issues of 1852 to 1870, at which date the Papal issues were superseded by those for the Kingdom of Italy. One of the keys is of gold, symbolising Power, and the other of silver, typifying Knowledge. The crown has three tiers, signifying the Pope's dominance over the Church militant, triumphant and purifying.

The principal feature of the design of the five higher values from 80c. to 10 lire, is a portrait of Pope Pius XI. The same portrait is used on the express stamps.

One of the most interesting features of the lower denominations is that the paper on which they are printed is minutely inscribed with the words "Poste Vaticane," repeated in line after line over the whole surface. The use of the French language for the identifying tablets is also of interest.

* * * *

The bi-lingual issues of South Africa are augmented by two new air mail denominations, 4d. and 1/–, that made their first appearance on 16th August. Both denominations employ the same design, a very simple, unostentatious affair, as is shown in our illustration of the 4d. stamp.

Monte Cassino Commemoratives

Italy's newest commemorative is in celebration of the fourteen hundredth anniversary of the establishment of the monastery of Monte Cassino by St. Benedict, the founder of the famous order that bears his name. There are six values in

the series, employing four designs. The 20c. and 75c. values are illustrated here.

The 20c. value shows the courtyard of the monastery, prominent in which is a beautiful fountain designed by Bramante, the great Italian architect to whom we referred in our stamp article last month. The designs of the 25c. and 50c. values are based on two of the beautiful frescoes that adorn the monastery, showing respectively the death of the Saint and a scene during the building of the monastery. A modern photograph of the monastery nestling on the crest of the hill behind Cassino, a small town situated midway between Rome and Naples, is the subject of the 75c., 1 lire 25c. and 5 lire values.

Falklands' Disappointing Issue

The coming of the new design for the Falkland Islands issues has been awaited for some considerable time, but we must confess that we find the result disappointing. The engraving is certainly not up to the standard for British Colonial issues. As will be seen from our illustration, the major part of the design consists of the King's head surmounting an ocean view, in which a whale is "blowing," this typifying the very important whaling industry that is carried on from the Islands. In the right foreground, on what is presumably a stretch of beach, there is a penguin, one of the Islands' commonest birds.

New Mexican Air Mail Stamps

Mexican aviation suffered a severe setback when the country's leading pilot, Captain E. Carranza, known as the "Mexican Lindbergh," was killed last year. His machine, the "*Mexico-Excelsior*," crashed at Mount Holly, New Jersey, at the commencement of a return flight to Mexico on 13th July. In commemoration of Capt. Carranza's death Mexico issued a new commemorative air stamp on 13th July of this year, and simultaneously a new general air mail issue.

The design of the commemorative stamp shows a picture of the biplane "*Mexico-Excelsior*" in flight across an inland

lake, with the snow-capped volcanoes of Popocatepetl and Ixtaccihuatl in the background. On the left, in a large oval tablet, is a portrait of the aviator. Across the head of the picture are two small date tablets giving the date of the death of the aviator and the date of issue of the stamp, and across the foot is another label intimating that the stamp is in memoriam of this national hero.

The second stamp is a very ingenious adaptation of the Carranza commemorative, the pictorial design being exactly the same, except that the portions of the scene obliterated by the date and dedication labels of the commemorative issue, are now brought in, while the tablet occupied by the Carranza portrait is given up to the national emblem, the eagle.

The Carranza commemorative issue contained six denominations, ranging from 5c. to one peso, but the general issue contains only five, 10c. to 35c.

Stamp Collecting—(*Continued from page 991*)

hobby and builds on the right lines will not only secure the satisfaction of seeing the value of his collection grow, but the even greater joy of knowing that his is a collection of which he may be justly proud.

We take this opportunity of making acknowledgment to Stanley Gibbons Ltd., for their courtesy in loaning the stamps from which the illustrations used with this article have been prepared.

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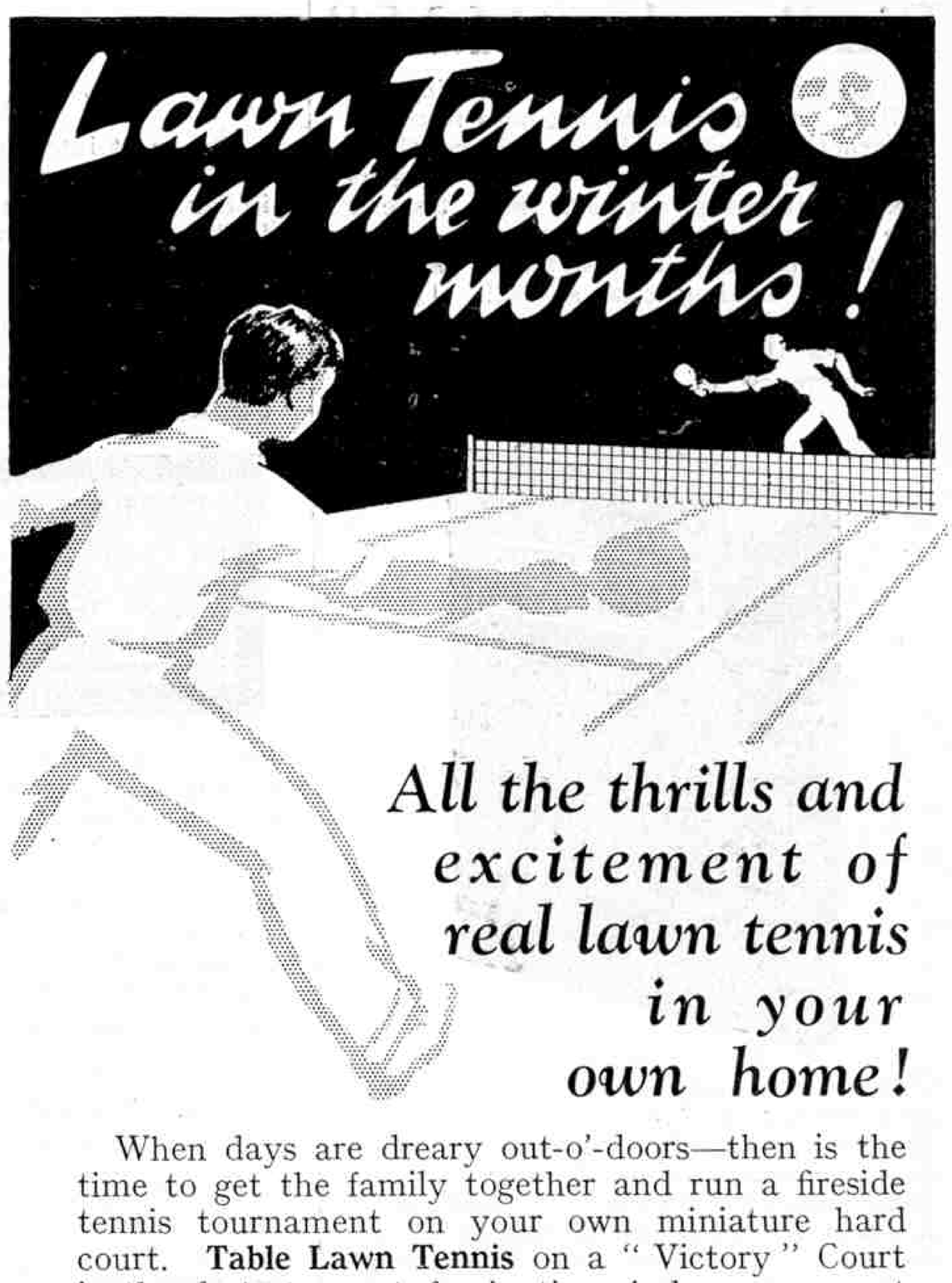

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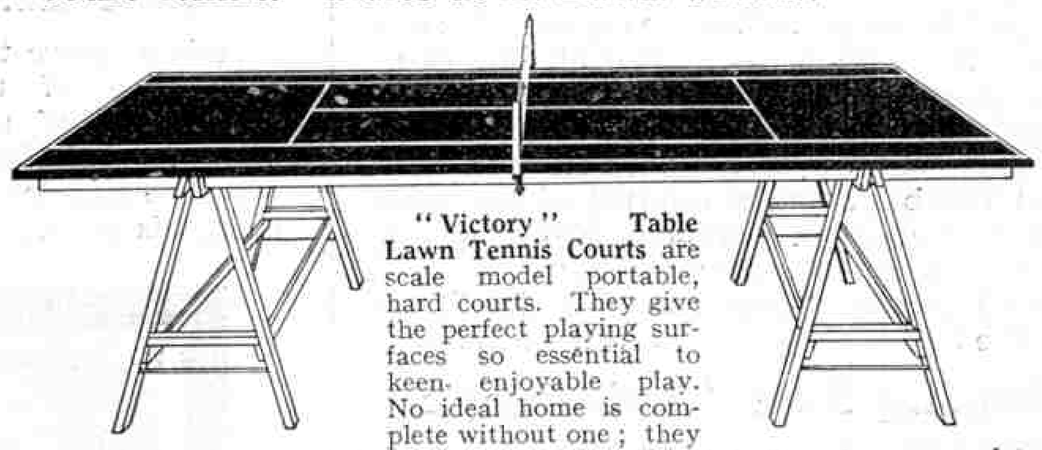

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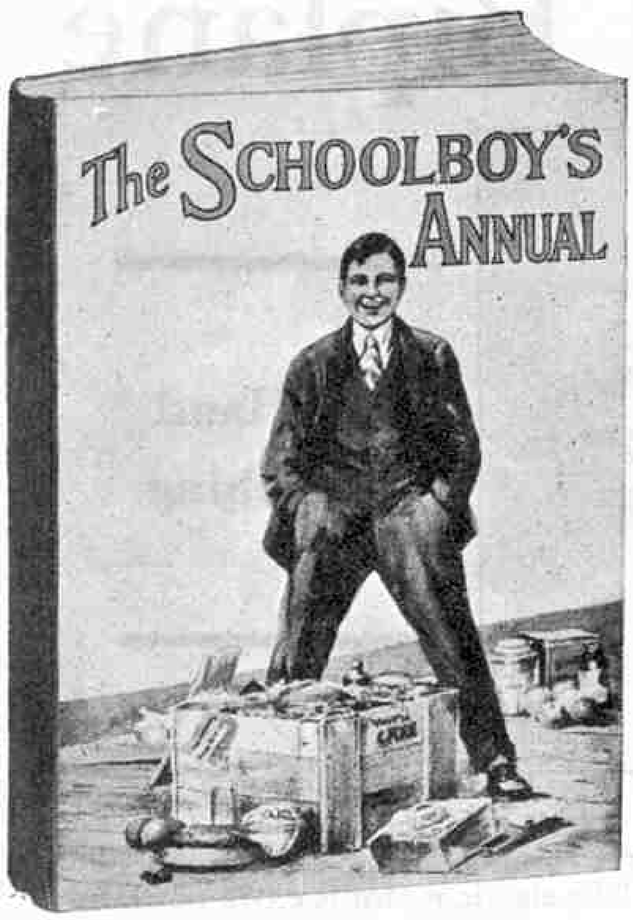

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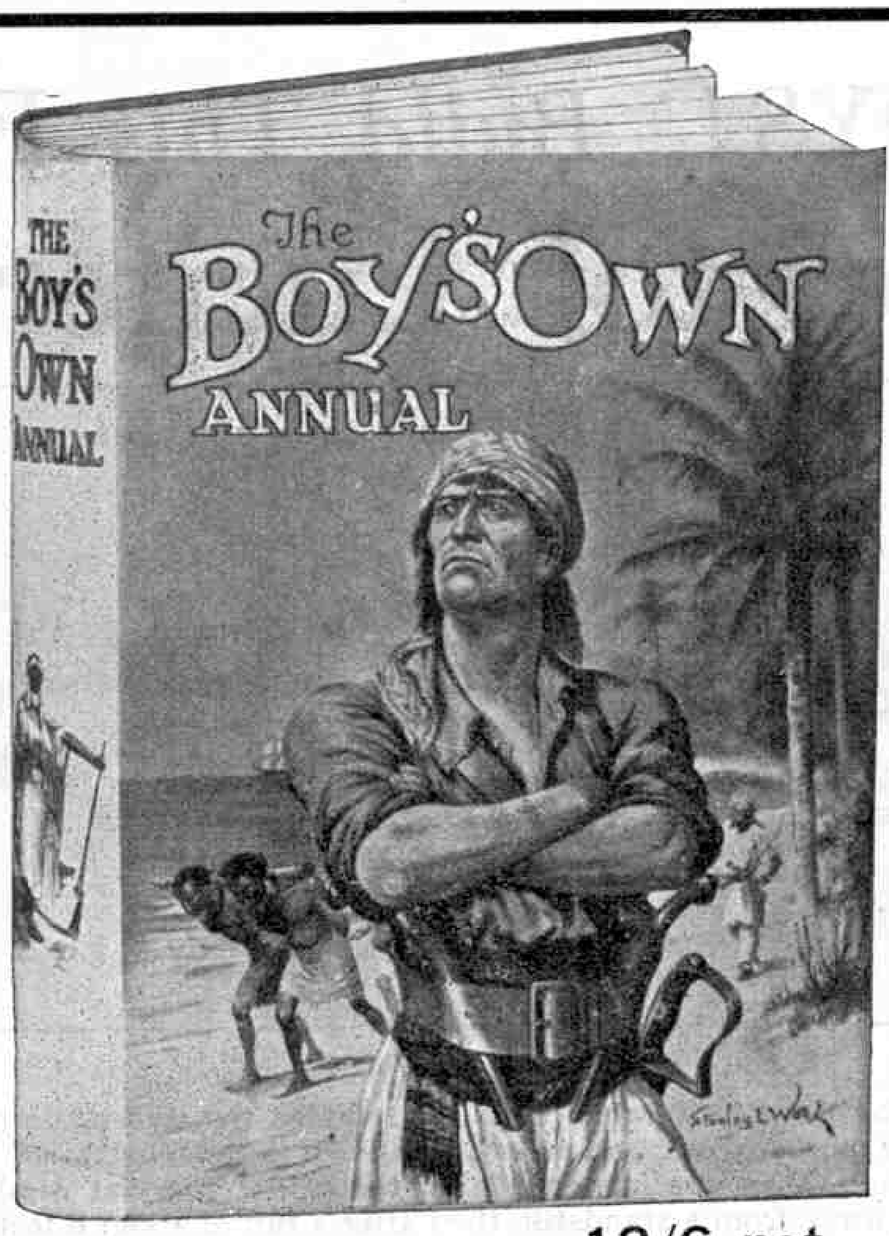

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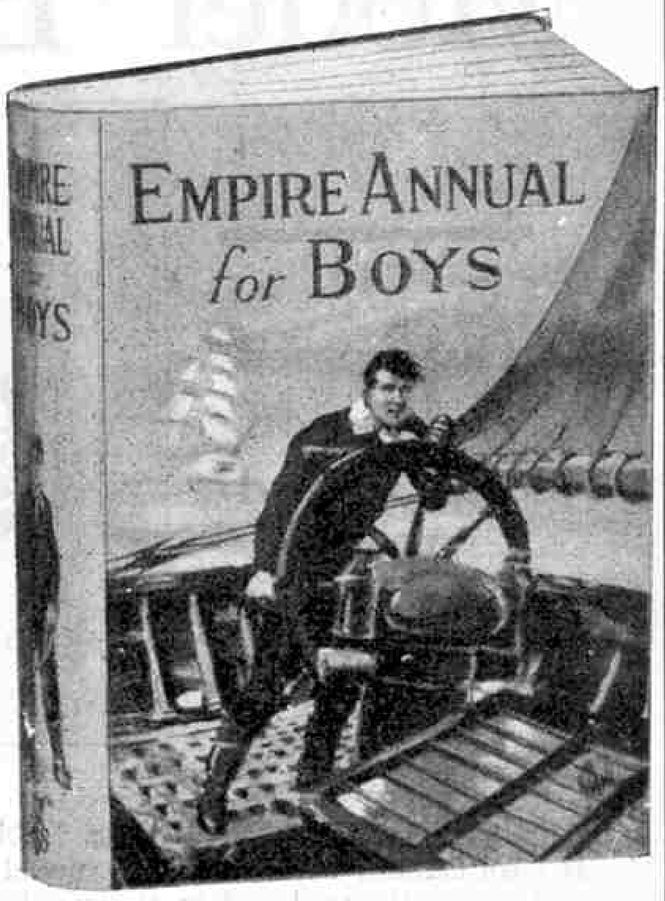

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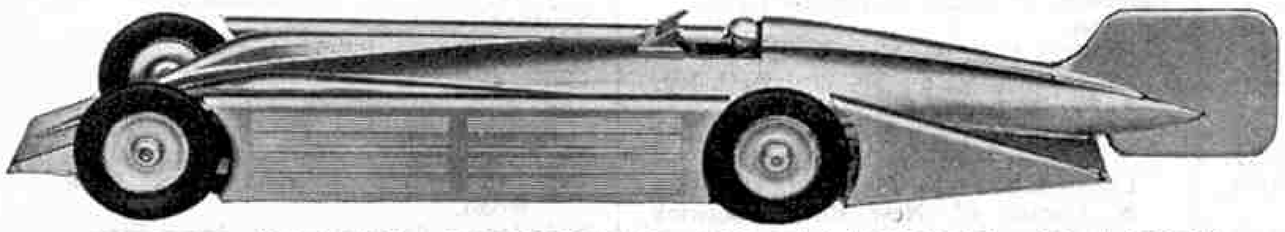

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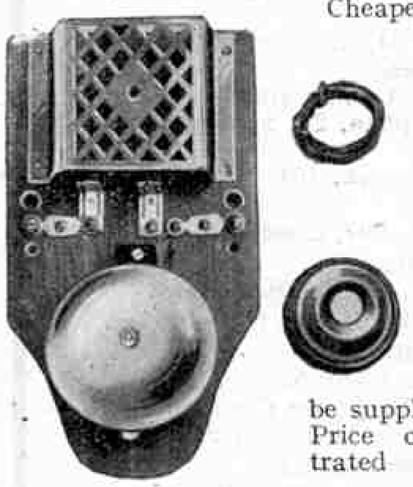

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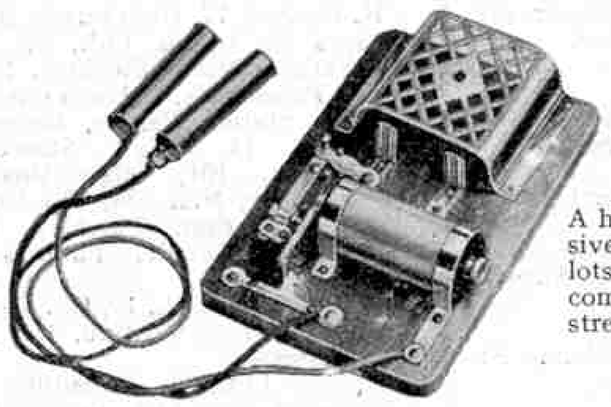

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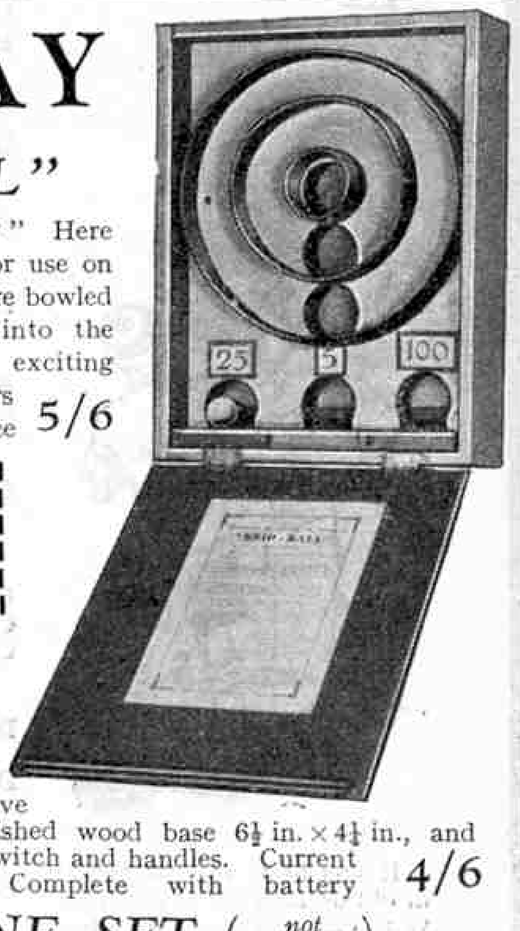

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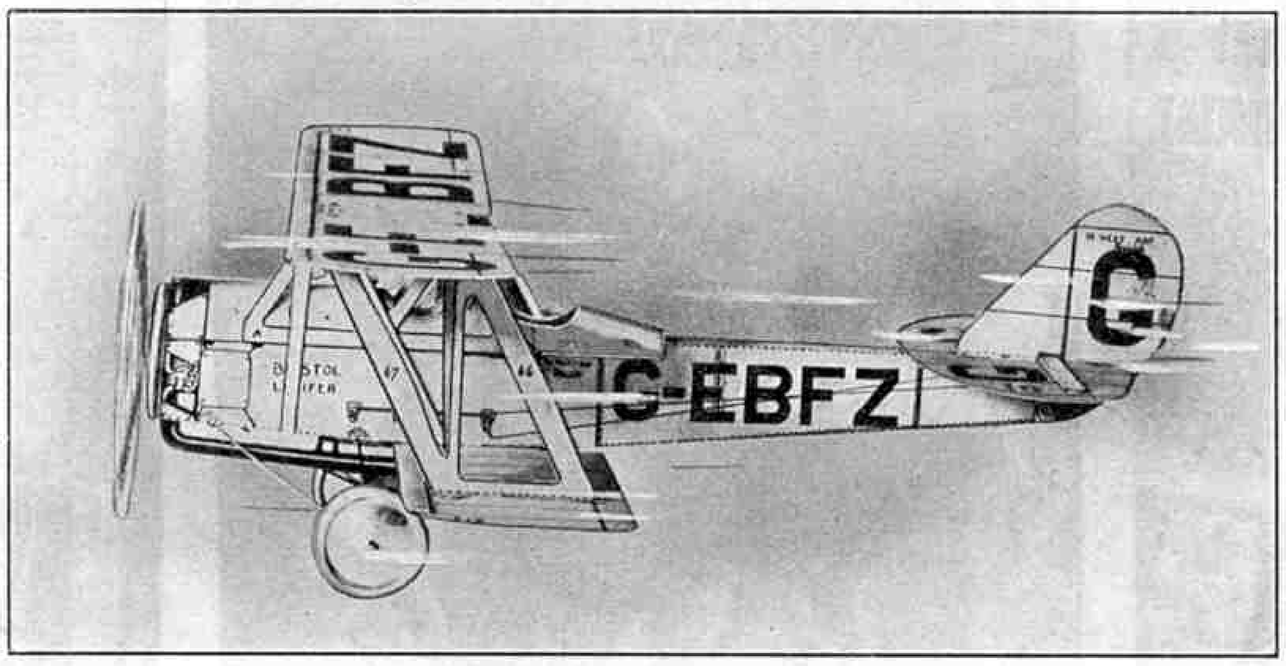

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Sutcliffe Models Rouse the Newspapers!

The Manufacturer of Sutcliffe Model Boats has been bombarded by newspaper men following the announcement that the ingenious system of propulsion which propels these models had attracted the attention of the Admiralty

Below is an Extract from the "Daily News," published on August 27th, 1929

TOY WARSHIPS ATTRACT NAVAL EXPERTS

GIRLS MAKE SECRET INVENTION

From Our Own Correspondent.

Horsforth (near Leeds), Monday.

Admiralty experts are keenly interested in miniature hot-air battleships now being built by girl workers in a workshop here owned by Mr. J. W. Sutcliffe.

It is the means of propulsion of these toy men-o'-war that has attracted the naval experts. It is believed they are considering the possibility of the idea being used on a larger scale for certain types of ships in the navy.

The production of power for these model warships is simplicity itself, if you knew the secret.

It is by means of coiling and bending an ordinary copper tube in a certain way, known only to Mr. Sutcliffe and his two sons, that, when heated through the agency of a small spirit lamp, an action similar to that of a motor-boat is produced. The two ends of the copper tube are brought through the stern of the boat just under the water line and the coiled part, which is the section heated, is in the hold beneath the bow.

"When the tube becomes hot," said Mr. Sutcliffe in an interview I had with him to-day, "water which has run into the tube is ejected in the form of steam. This is replaced by more water, which in turn is instantly turned into more steam, and this action goes on so rapidly and continuously that the boat is constantly propelled forward.

"There is no fear of an explosion through the use of the spirit, a pennyworth of which will drive the biggest model for three hours at a stretch."

FREE DESCRIPTIVE BOOKLET

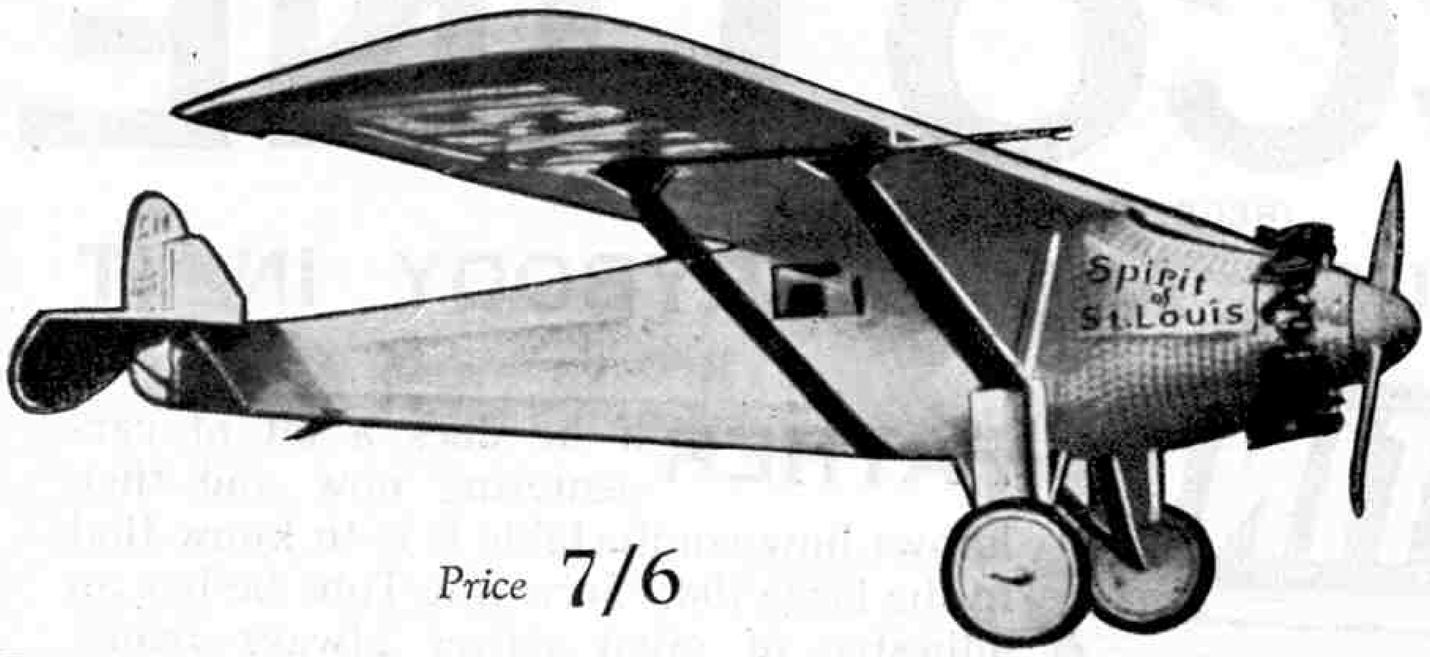
An attractive booklet together with other literature giving full particulars regarding these mysterious model boats will be sent free to you on receipt of a postcard. When sending for this booklet please write your name and address clearly and state the names and addresses of the best toy dealers in your district.

Sutcliffe models range in price from **4/6** to **15/–** complete, and you must have one for Christmas. They will work quite well in the bath at home as well as out of doors.

Send a postcard to-day for your free booklet and learn all about them.

J. W. SUTCLIFFE
HORSFORTH - LEEDS

"SPIRIT OF ST. LOUIS"



Price 7/6

Exact model of Lindbergh's historic machine that made the great flight from New York to Paris. Just one of the twenty-five models. Packed in attractive box 14″ × 8¼

CONSTRUCTION SETS

With this splendid constructional set you can build perfect models of twenty-five different Aeroplanes with one, two or three engines, including those famous types flown by world heroes of the air—Lindbergh, Cobham, Byrd, Hawker, and many others. Contents of box: over 120 parts made of heavy steel or copper with rustproof finish. Wing spread 14¼″. Tools and instructions provided.

Also larger sizes, to build over 100 models ... ... Price **15/6**

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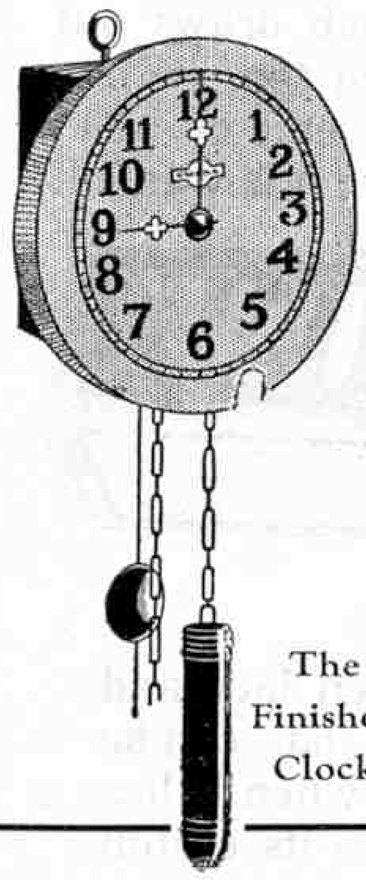
Also magnificent constructional Zeppelin set to build "R.101," "Graf Zeppelin," etc. ... ... Price **27/6**

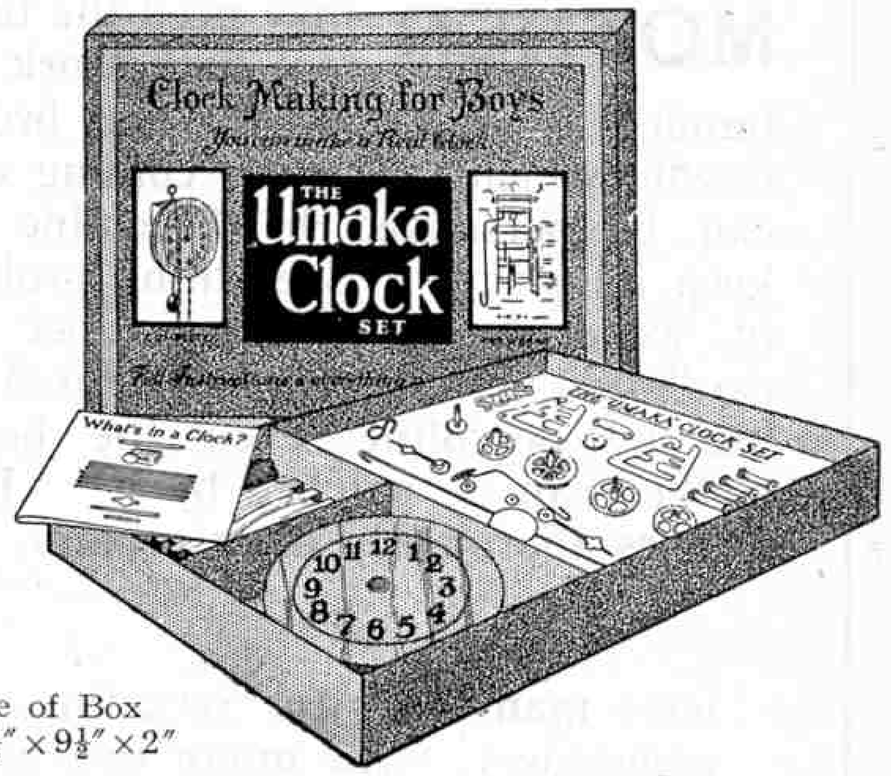


The Finished Clock

"UMAKA" CLOCK

Here is a set of parts for making the real thing, a working useful clock. The British "Umaka" Clock Set is simple to construct, the instructions will intrigue every intelligent boy, and it is simple and interesting to keep regulated. Each set contains over 40 finished, interchangeable parts, all marked and named, with polished wood dial. Guaranteed to make a complete clock—no other parts being required. It has a real clock movement.

Price 7/6



Size of Box
13½″ × 9½″ × 2″

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THE MOST MYSTERIOUS ELECTRIC GAME

This is the greatest fun maker of the age, it is the game that asks you questions, puzzles you, teases you, and then with a loud BUZZ tells you the correct answer. Question cards in colour "In the Inky Depths of the Sea," "Merchant Flags of all Nations," "Dogs," "Life of the Ant," "A Day at the Zoo," "Wild Flowers," etc., etc. A telegraph key is also fitted which enables anyone to learn Morse and Continental codes, which are illustrated on inside of box. Battery supplied. No electric connection required.

Price 18/6

Obtainable from all good Toy Departments and Toy Shops throughout the country. In case of difficulty write direct to

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(REGD. TRADE MARK)

FOR THE HOUSE AND EVERYBODY IN IT

MOTHER may need the tube for housework a hundred times a day—the long brush handle which insists on coming out can be persuaded by Seccotine to keep its place. Everything broken of wood, leather, bone, paper or cardboard, cloth, can be restored to use by Seccotine—even the boys' clothes can be patched by it. Dry articles thoroughly after repairs.

FATHER if he does a bit of carpentering now and then knows how comfortable it is to know that in the large (9d.) Seccotine Tube he has an adhesive of great power always ready. No heating, no looking for a corkscrew to open a bottle, no difficulty with a locked screw cap, the tubes are stoppered with a galvanized iron spike which draws out with ease. The cone shaped top, with a little pressure at the folded end of tube, places the adhesive just where it is wanted.

GIRLS

have many uses for Seccotine. They repair clothes, mend books, stiffen lace and embroidery. The minor uses are endless and the second size in cartons (6d.) can be conveniently kept in the work basket. The pin supplied with each tube when it has pierced the cone, acts as stopper. If the stoppered tube is put back into its carton this can be thrown into the work basket without danger of escape of contents.

BOYS WILL BE BOYS

and boys, if they are worth anything, will always be making something. For the big things they will want a big tube, but for numberless things it will be sufficient to have in the vest pocket one of the little enamelled boxes (4½d.) illustrated here. And good boys who know when a powerful adhesive is wanted will recommend their fathers to carry the enamelled box in their vest pockets. It is surprising how often in the day the need for an adhesive can be satisfied with the little enamelled box in the pocket.

The word "Seccotine" is a registered Trade Mark. Seccotine is sold everywhere from China to Peru. The shops selling it in the British Islands and France are numberless.

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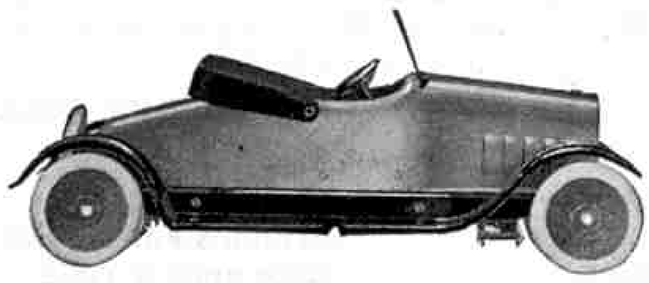

No. 12. DE LUXE MOTOR

This is the most perfect reproduction of a real motor car ever produced. Notice the modern design, slanting windscreen, with under-slung body, spare wheel, etc. Triple unit motor, genuine gear transmission, two speeds forward, and reverse (see illustration). Regular " big car " Differential. Gear lever, gearshaft control, separate winding crank. Finished in blue enamel, nickel fittings and black mudguards. 16″ overall, 12½″ wheel base, 6″ track. *Price* **47/6**

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Streamline Racer with main shaft control lever, single unit motor. Finished green. 12½″ overall. 10″ wheel base, 5½″ track. In box ready to build. Price **27/6**

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Sporting Two-Seater. Same mechanism as No. 8. Finished red. 15″ overall, 12″ wheel base, 5½″ track. In box, ready to build. Price **35/–**

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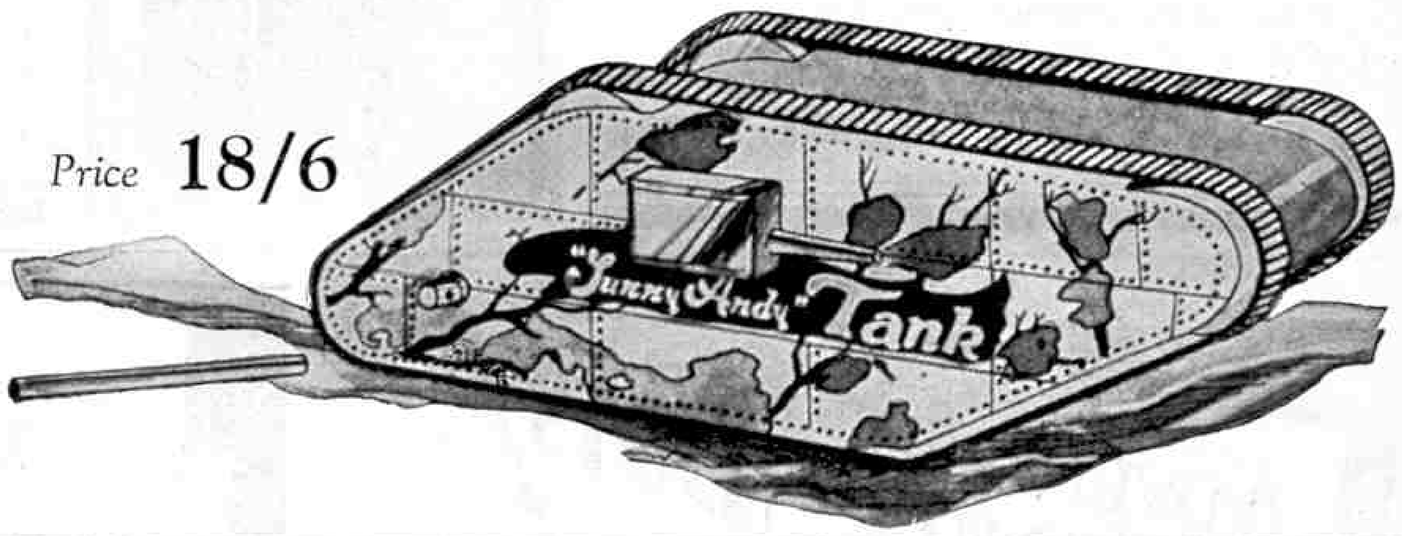
Large powerful construction, with triple motor, main shaft control lever. Finished green and red. Tractor 11″ × 4″ × 7″. Trailer 5″ × 4″ × 2½″. In box, ready to build. Price **35/–**

DE LUXE MOTOR. No. 12
In box ready to build

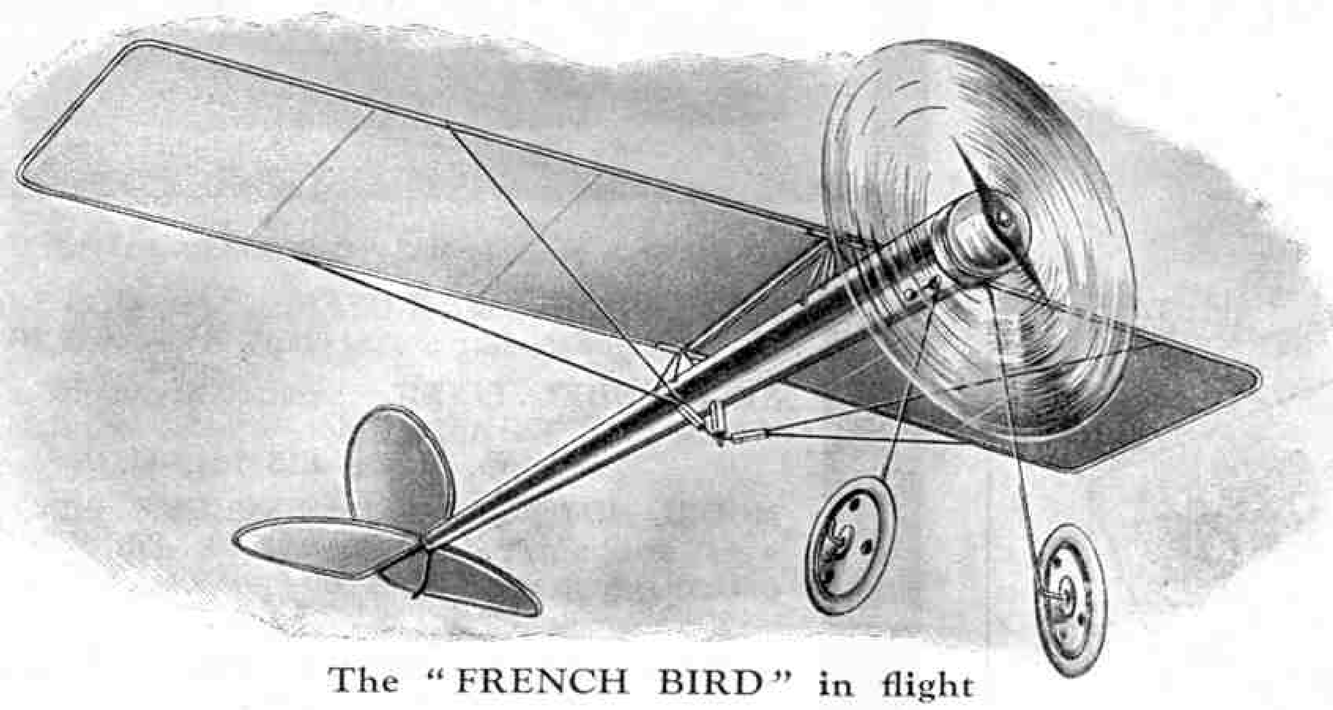
The Famous "SANDY ANDY" TANK

This is the finest miniature army Tank in existence both as regards appearance and performance. It will climb high obstacles with the normal action of a Tank in the battlefield. Built with positive-action caterpillar belt drive with wheels with non-slip device, powerful motor and start and stop control. The "Sandy Andy" Tank is made of heavy metal and finished with brilliant zig-zag camouflage markings. Size 14¾″ long; 6¼″ wide; 4¼″ high. Packed in attractive box. Weight 5 lbs.

Price **18/6**



The "FRENCH BIRD"



The "FRENCH BIRD" in flight

Vedette	**Course**	**Record**	**Sport**
Flying distance	Flying distance	Flying distance	Flying distance
100 yards	150 yards	200 yards	300 yards
Price **6/6**	Price **9/–**	Price **13/6**	Price **19/6**

The " FRENCH BIRD " Miniature Aeroplane, as illustrated, is a remarkable flyer, is practically indestructible, easy to put together and instantly ready for flight, without any adjustment. It is a scientifically designed Monoplane, with wings supported by struts, and an elastic motor enclosed in fuselage. No matter to what hard usage the aeroplane is put, there is no damage possible which cannot be put right in a few seconds.

A descriptive booklet is provided, giving fullest instructions for assembling and flying, together with an explanation in simple terms of the principles of aeronautics. From this the owner may learn to make the " FRENCH BIRD " perform many of the stunts done by real aeroplanes, such as looping the loop, spirals, etc.

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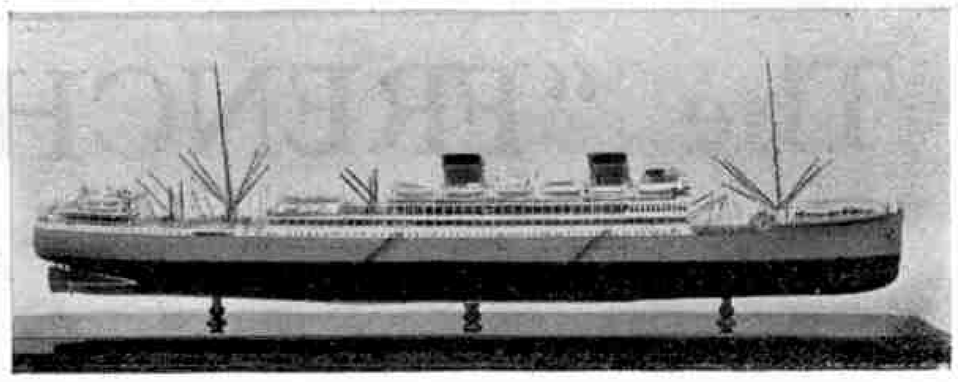

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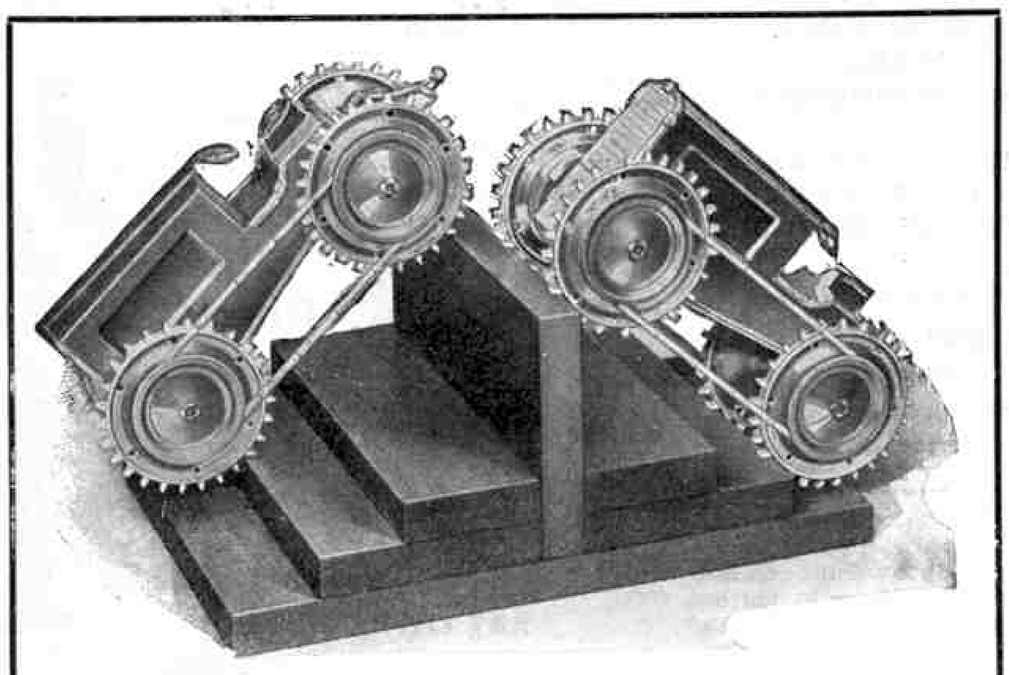

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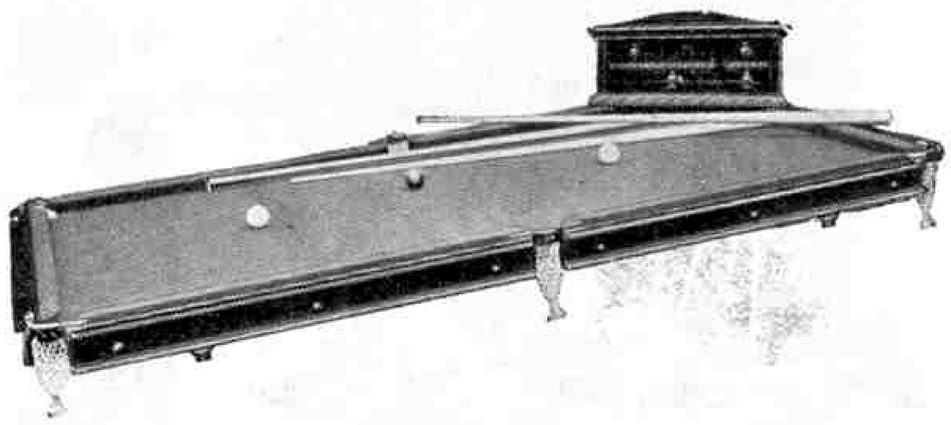

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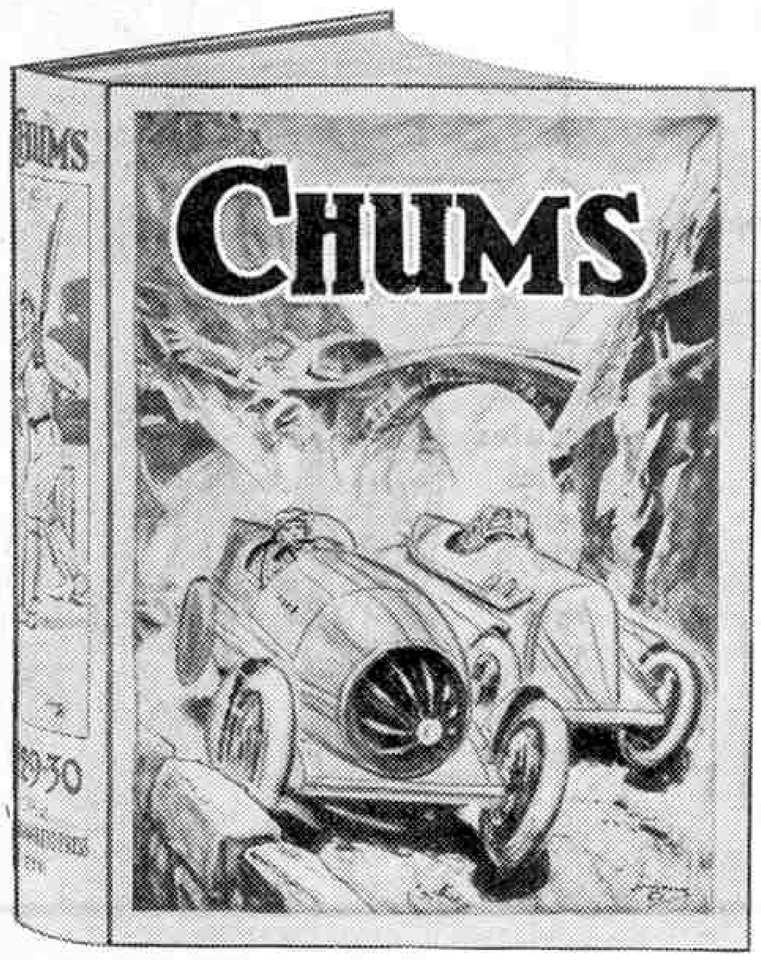

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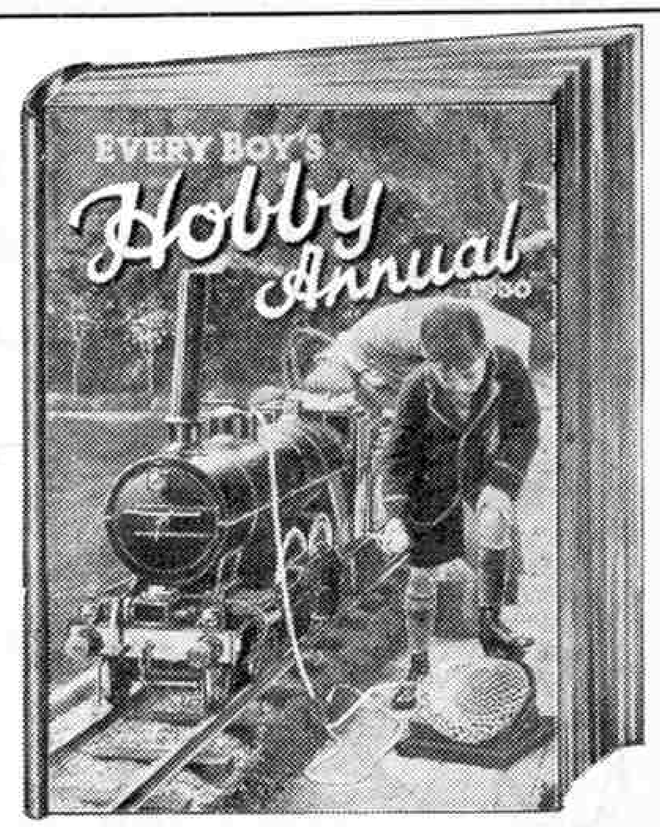

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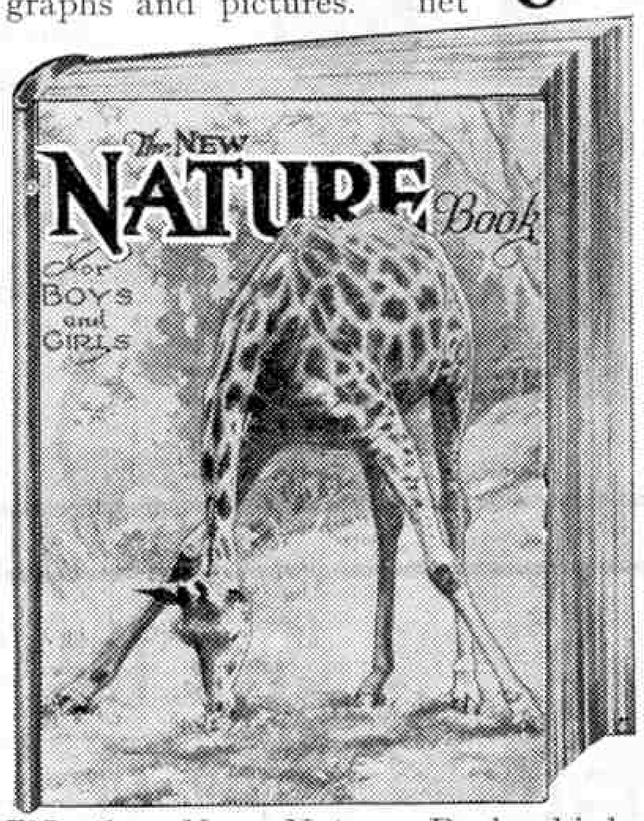

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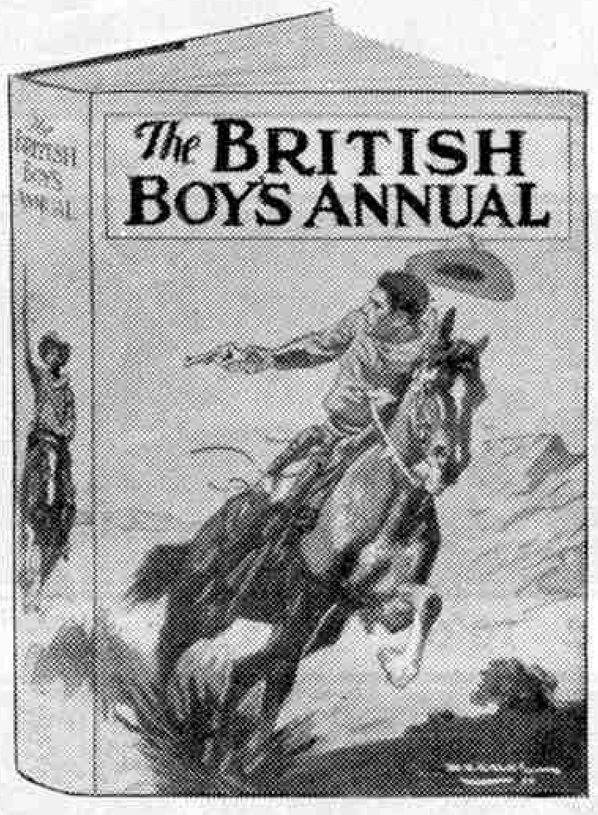

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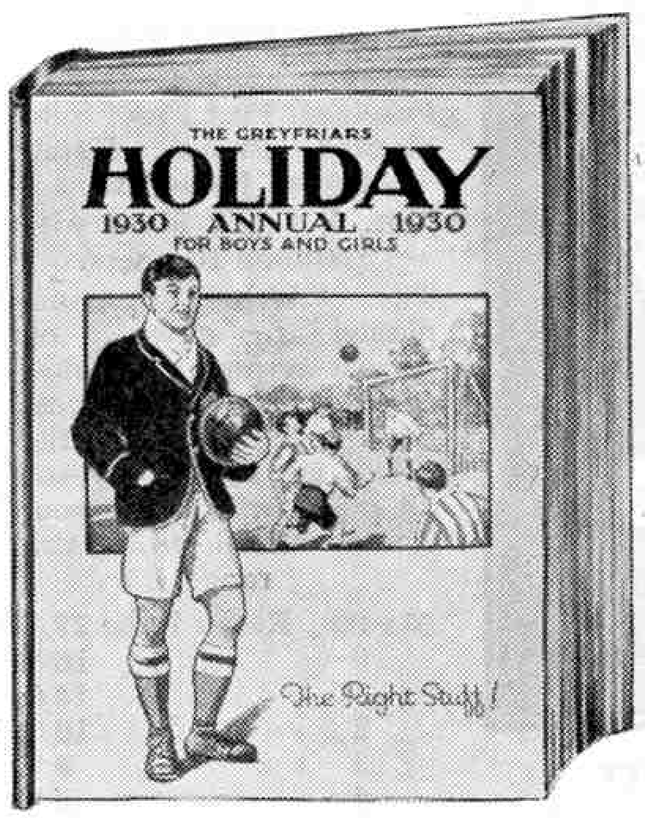

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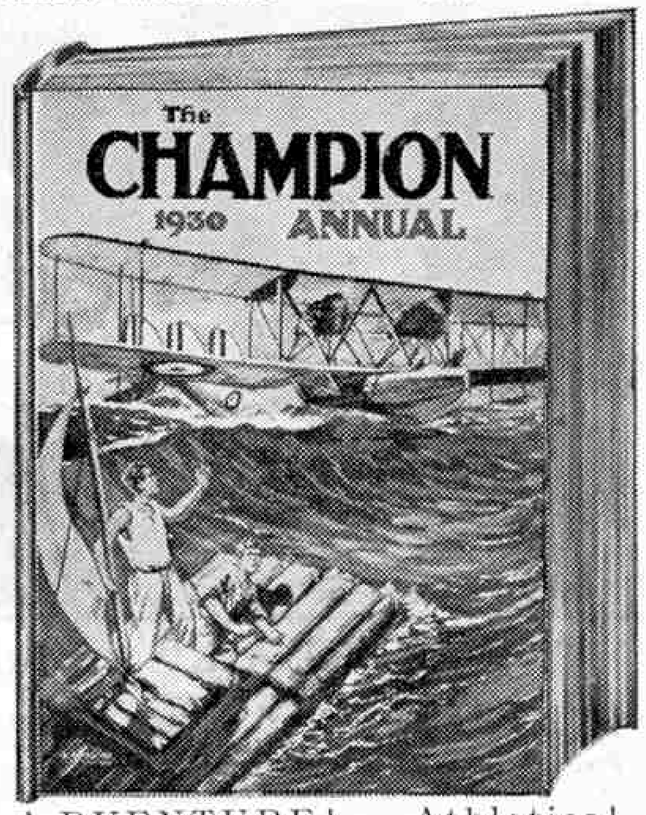

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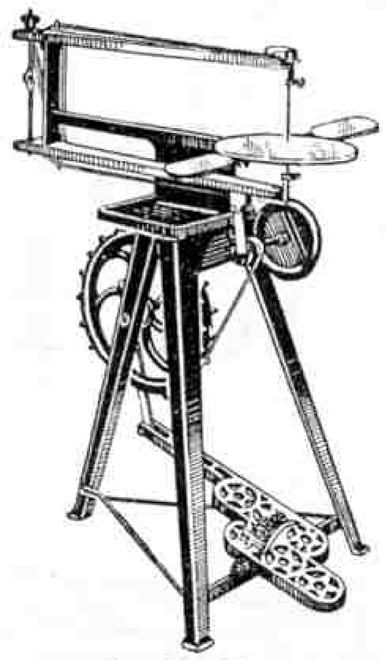

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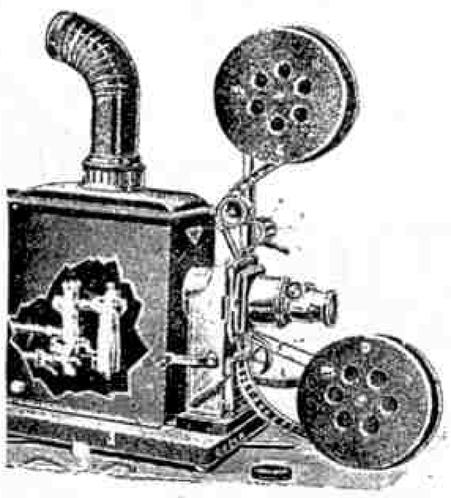

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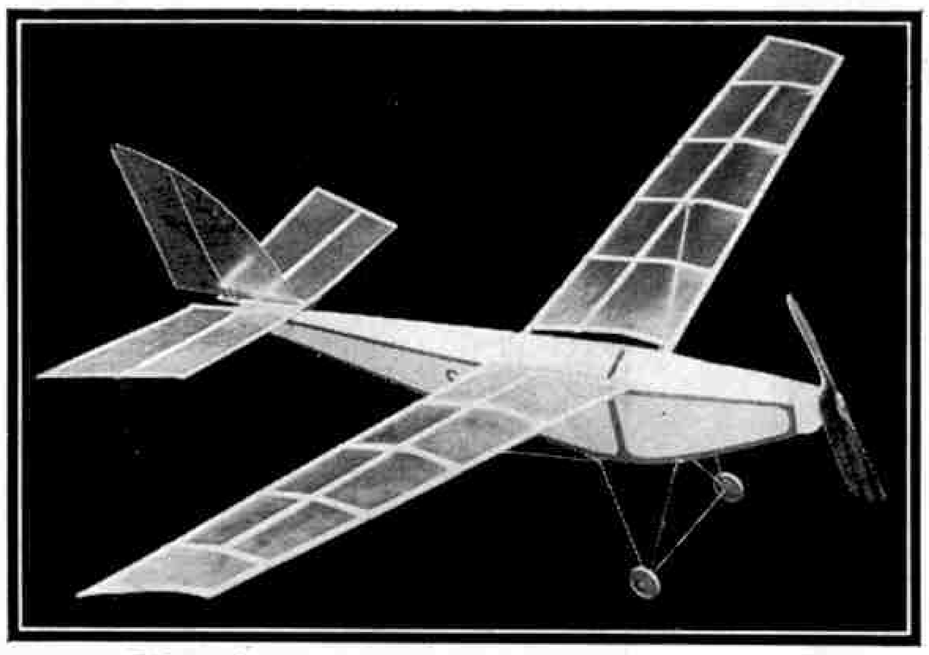

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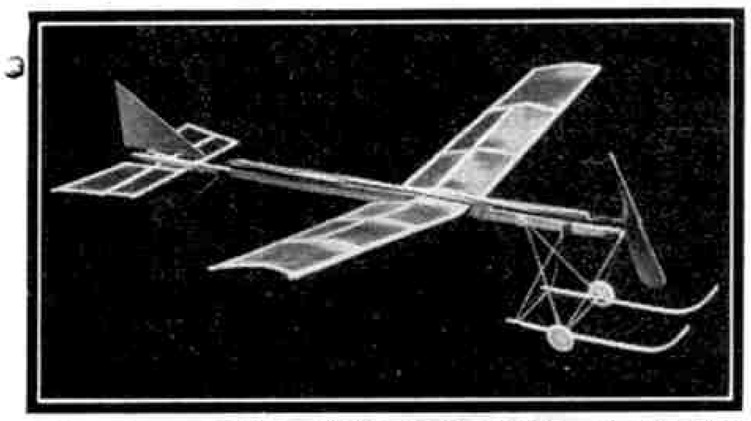

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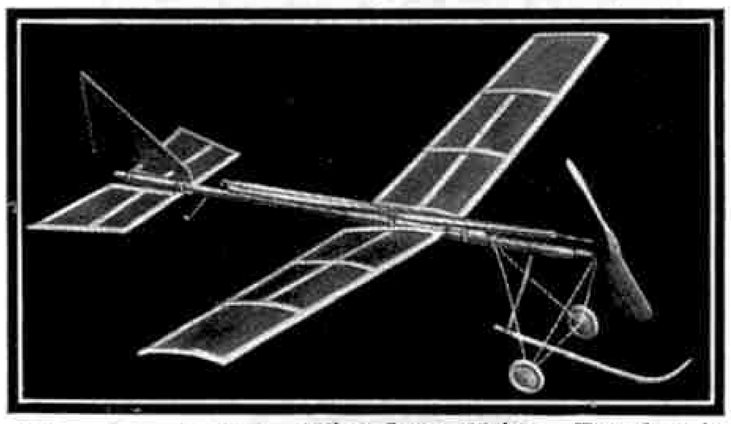

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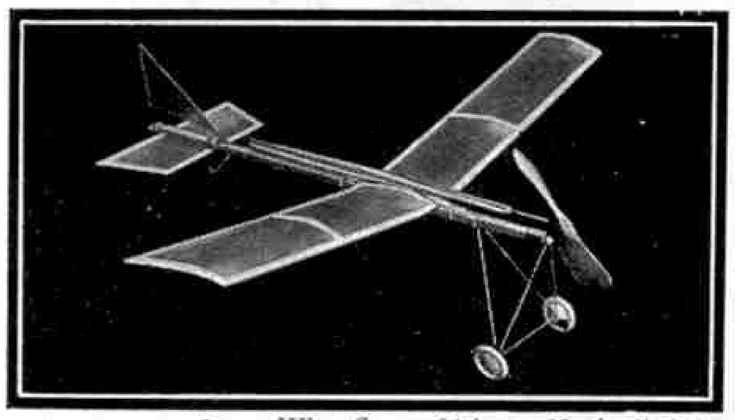

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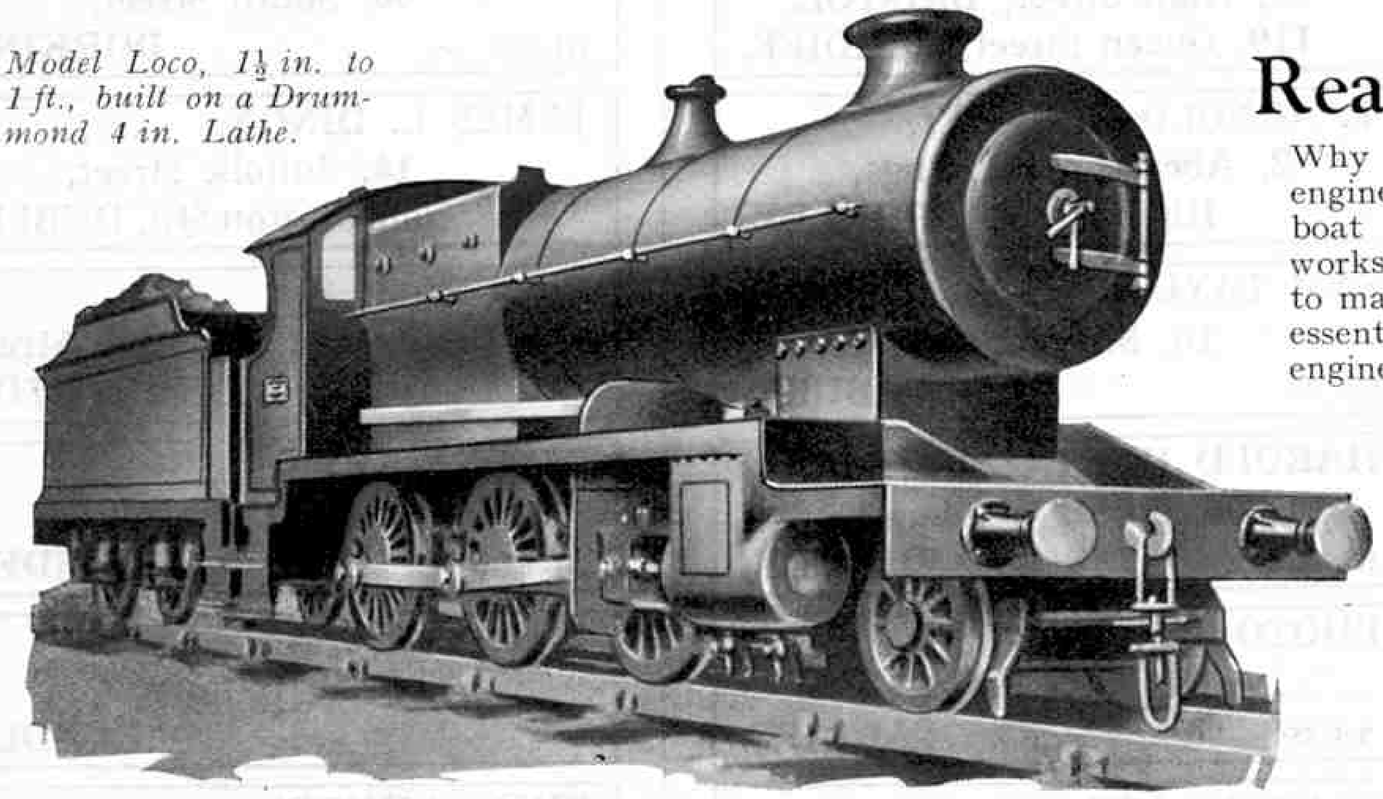

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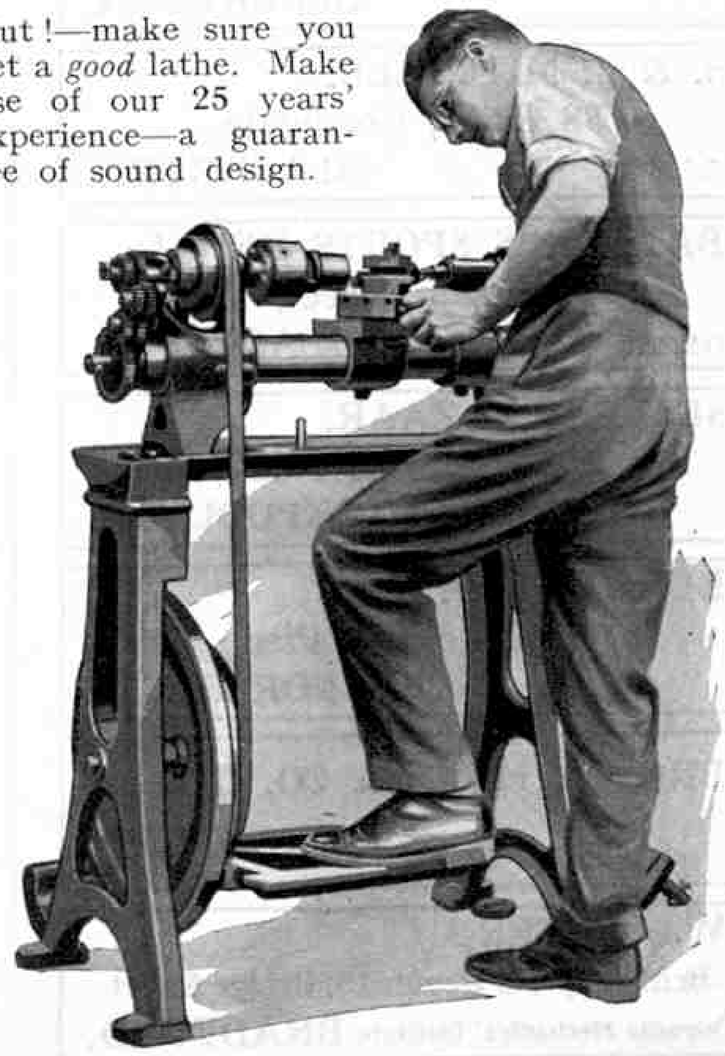

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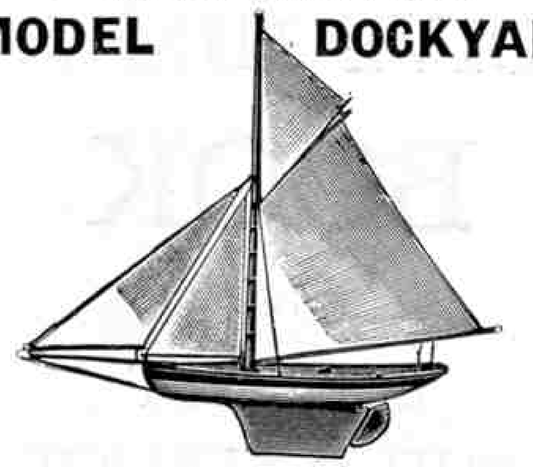

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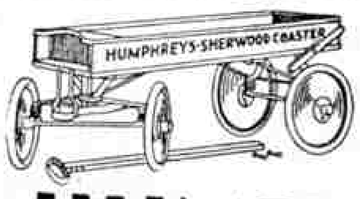

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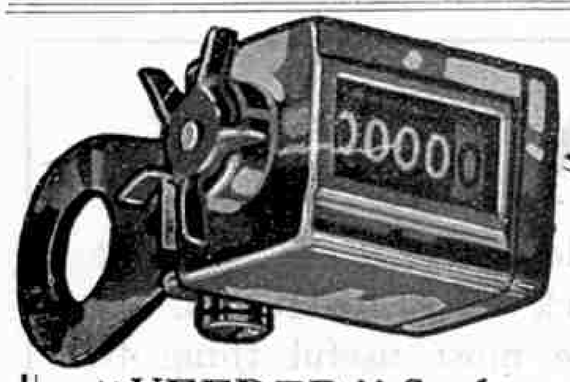

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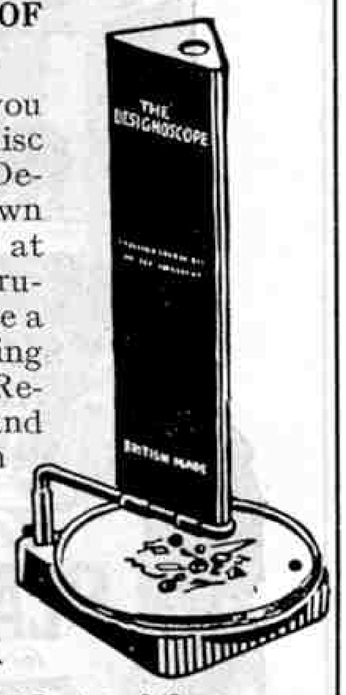

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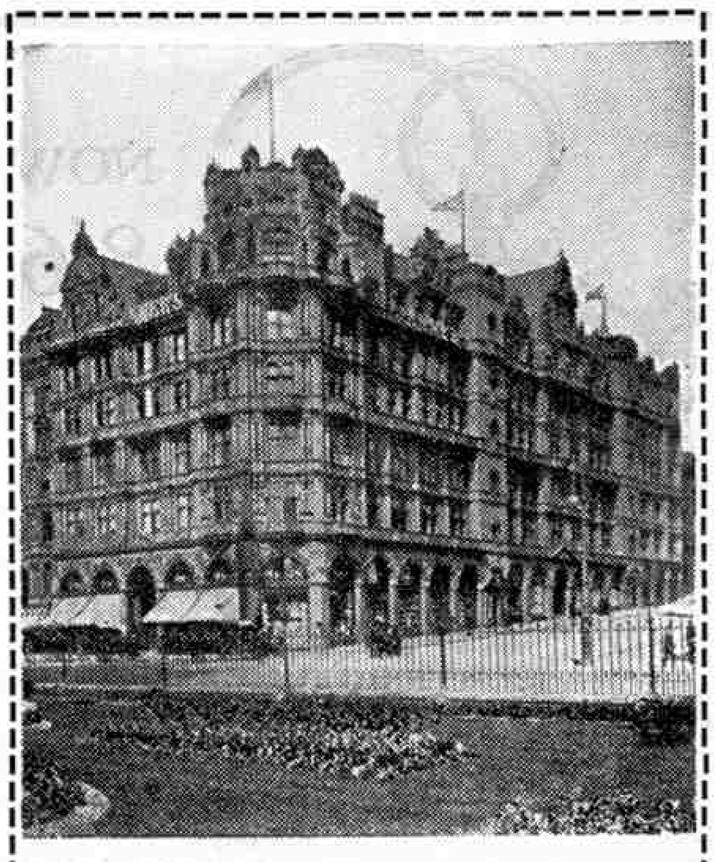

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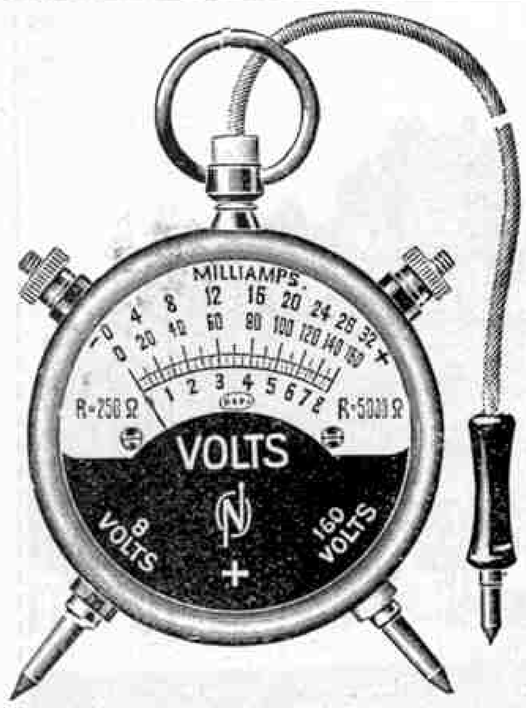

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How to Get More Fun—*(Continued from page 971)*

at 8.16. Provision must be made for these to pass each other on the way and in order to observe how this is done, we will join the engine driver on the footplate of the No. 1 Goods Tank Locomotive that hauls the goods train.

As we pull out of the goods siding at the terminus A we have behind us a long mixed train of wagons, vans and two goods brakes. Proceeding over the junction we make our way along the track to B, where we stop in order to pick up empty milk cans. We proceed onward, and eventually the station at C comes into sight. Signals show that the track is clear on to the loop road, and we draw up into the station as far as the platform signal, which is against us. Our time of arrival is 8.14, and we are only a fraction of a second late.

We soon realise why we have been stopped at C, for the signals on the opposite side of the track that give right of way to a train approaching from D are down. This is the "down" local, due to leave D at 8.14. Shortly before 8.14½ it comes into sight and pulls up at the main line platform. As soon as it has passed over the loop points these are set to allow our goods train to pass on to the single line ahead. Our rear brake van already has been uncoupled in order that it may be left behind in the station, and now we back into the siding to pick up wagons that are to be taken on to D. After the brake van has again been hitched on to our rear, we continue our journey to the terminus, leaving C at 8.15. Of course the "down" local left this station on its way to B half a minute earlier.

Much interesting fun may be obtained by working to a timetable of this kind. The examples given do not exhaust the possibilities, and next month we hope to deal with other operations of even greater interest for which the layout and timetable are suitable.

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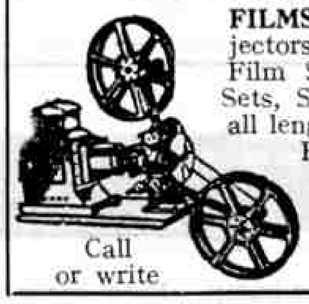

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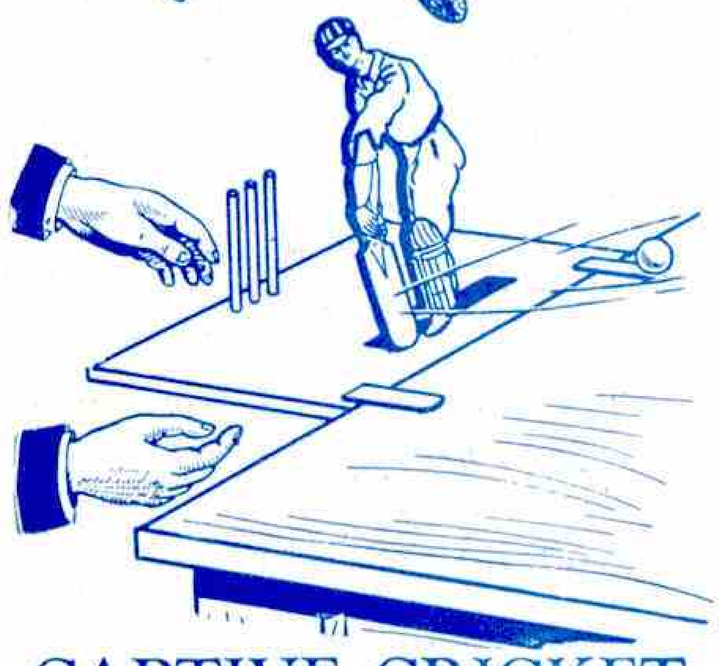

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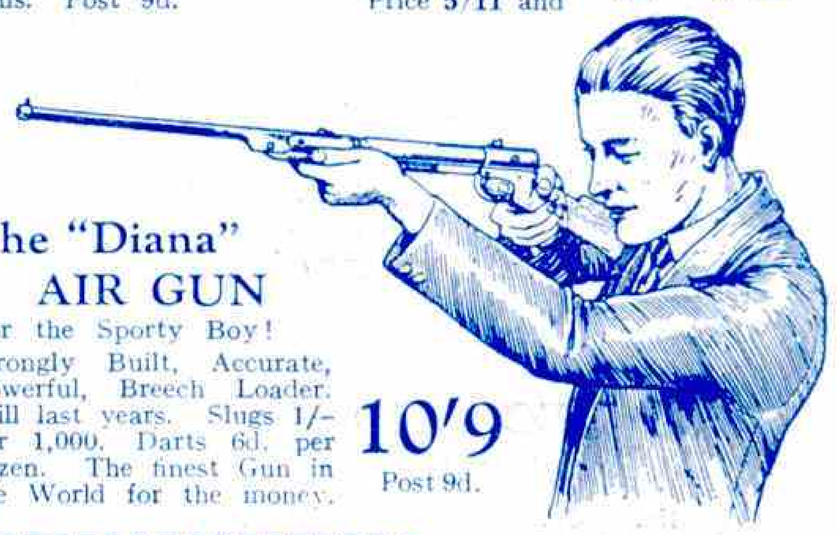

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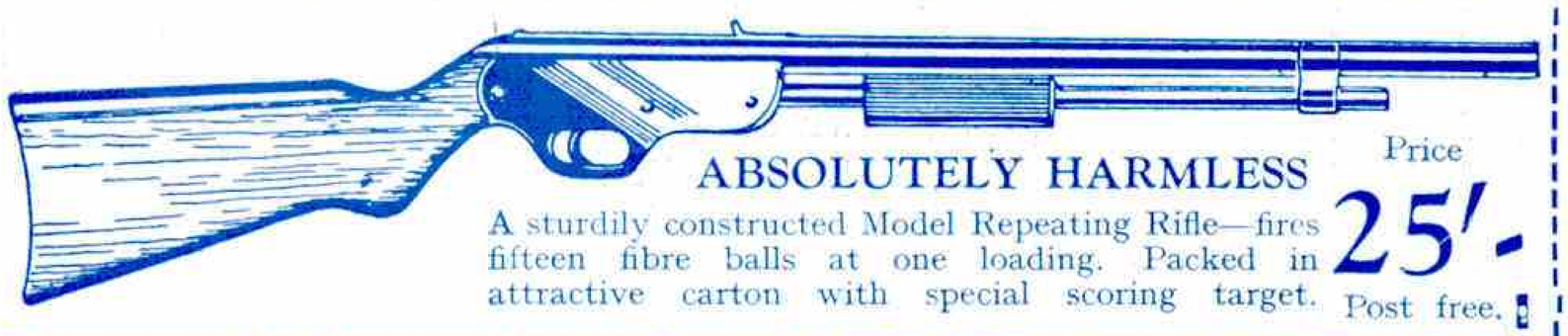

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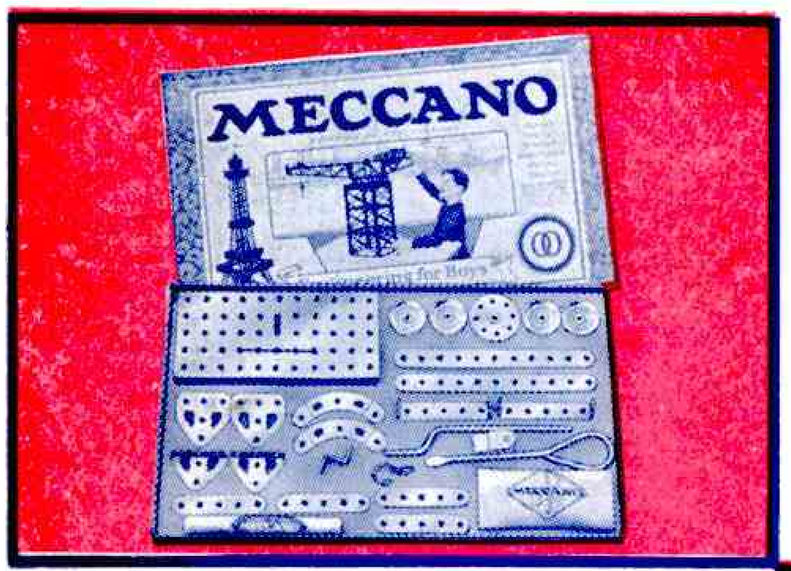

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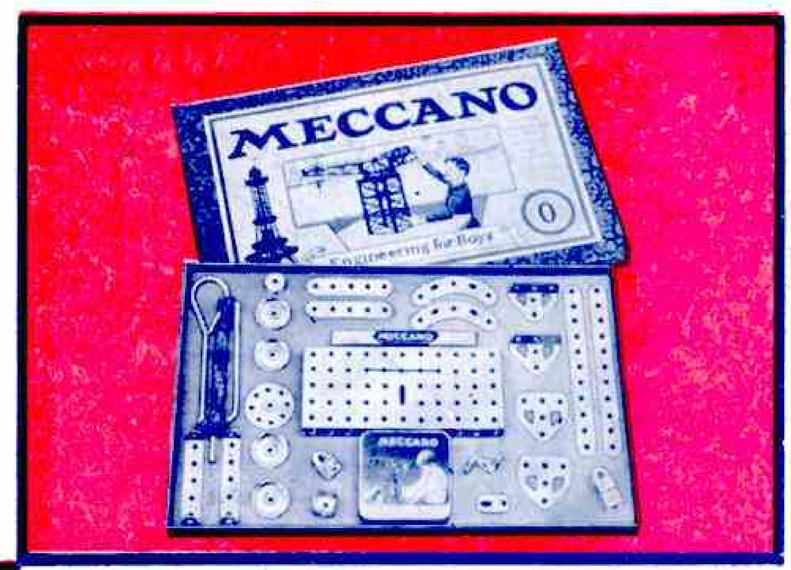

205

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Builds 205 Models

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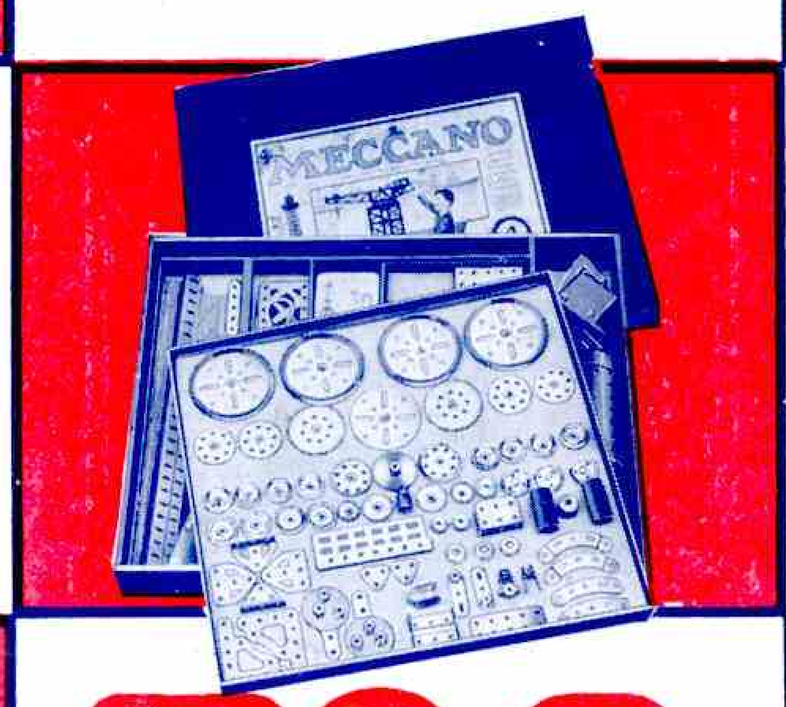

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